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ASSEMBLY C CSI SOLID WASTE MANAGEMENT UNITS 26, 27 AND 62 REVISION 2
MILLINGTON SUPPACT TN
9/25/1996
ENSAFE/ ALLEN AND HOSHALL

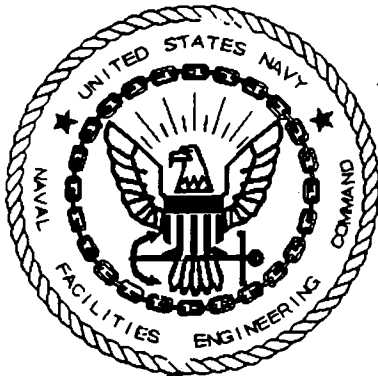
**ASSEMBLY C CSI REPORT
NAVAL SUPPORT ACTIVITY MEMPHIS
MILLINGTON, TENNESSEE**

SWMUs 26, 27, AND 62

REVISION 2

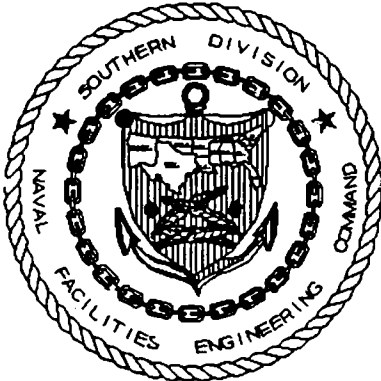
CTO-094

Contract No: N62467-89-D-0318



Prepared for:

**Department of the Navy
Southern Division
Naval Facilities Engineering Command
North Charleston, South Carolina**



Prepared by:

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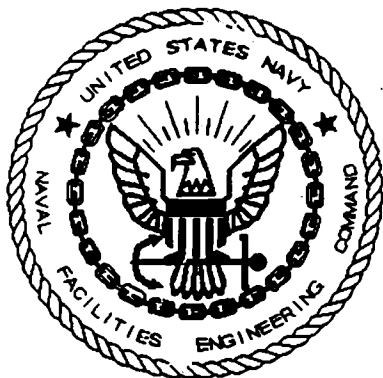
September 25, 1996

Table of Contents

SWMU 26	Confirmatory Sampling Investigation — SWMU 26 — N-102 Battery Acid Neutralization Unit
Appendix A	Analytical Results — N-102 Battery Acid Neutralization Unit Contents
Appendix B	Analytical Results — CSI Samples
SWMU 27	Confirmatory Sampling Investigation — SWMU 27 — Northside Sewage Treatment Plant
Appendix A	Analytical Data
SWMU 62	Confirmatory Sampling Investigation — SWMU 62 — M-21 Arresting Gear
Appendix A	DPT Piezocone and Hydrocone Plots
Appendix B	Analytical Data
Attachment 1	Data Validation Report — Assembly C
Attachment 2	Miscellaneous Soil Boring and Monitoring Well Logs
Attachment 3	Dieldrin Technical Memorandum

**ASSEMBLY C CSI REPORT
NAVAL SUPPORT ACTIVITY MEMPHIS
MILLINGTON, TENNESSEE**

**RCRA FACILITY INVESTIGATION
SWMU 26 — N-102 BATTERY ACID
NEUTRALIZATION UNIT**



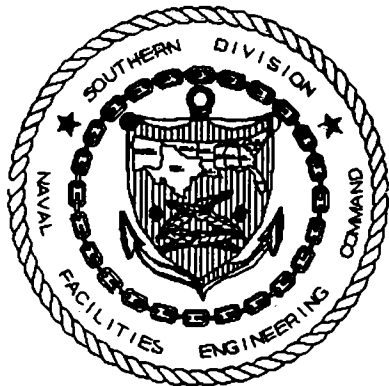
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Table of Contents

EXECUTIVE SUMMARY	iv
1.0 INTRODUCTION	1-1
2.0 SITE DESCRIPTION AND HISTORICAL INFORMATION	2-1
2.1 Site Description	2-1
2.2 Historical Site Operations	2-1
3.0 PRELIMINARY INVESTIGATIONS	3-1
4.0 FIELD INVESTIGATIONS AND METHODOLOGY	4-1
4.1 Investigation of Surface and Subsurface Soil	4-3
4.2 Sampling Rationale and Methods	4-3
4.3 Sample Processing and Chain-of-Custody Procedure	4-6
4.4 Grouting Procedures	4-7
4.5 Decontamination Procedures	4-7
5.0 GEOLOGY AND HYDROGEOLOGY	5-1
5.1 Regional Geology and Hydrogeology	5-1
5.2 Site-Specific Geology and Hydrogeology	5-2
6.0 NATURE AND EXTENT OF CONTAMINATION	6-1
6.1 Background and Reference Criteria	6-2
6.2 Soil Sample Analytical Results	6-2
6.2.1 Surface Soil	6-2
6.2.2 Subsurface Soil	6-7
6.3 Summary of Nature and Extent	6-7
7.0 PRELIMINARY RISK EVALUATION	7-1
8.0 CONCLUSIONS AND RECOMMENDATIONS	8-1
9.0 REFERENCES	9-1

List of Figures

Figure 1-1	Vicinity Map	1-2
Figure 1-2	Digital Orthophotograph	1-3
Figure 2-1	Site Map	2-2
Figure 2-2	Construction Details — N-102 Battery Acid Neutralization Unit	2-3
Figure 4-1	Soil Sample Locations	4-4
Figure 6-1	Background Sample Locations	6-3

Figure 6-2	Soil Contaminants Summary	6-9
Figure 6-3	Transfer from Soil to Groundwater SSL Exceedances	6-10

List of Tables

Table 6-1	Detected Concentrations of Metals, Pesticides, and SVOCs in Surface Soil	6-4
Table 6-2	Detected Concentrations of Metals in Subsurface Soil	6-6
Table 7-1	PRE for Residential and Commercial Carcinogens	7-3
Table 7-2	PRE for Residential and Commercial Noncarcinogens	7-4

List of Appendices

Appendix A	Analytical Results — N-102 Battery Acid Neutralization Unit Contents
Appendix B	Analytical Results — CSI Samples

LIST OF ACRONYMS AND ABBREVIATIONS

BRAC	Base Realignment and Closure
bls	below land surface
cm/sec	centimeters per second
CSI	Confirmatory Sampling Investigation
DQO	Data Quality Objective
E/A&H	EnSafe/Allen & Hoshall
HI	Hazard Index
ILCR	Incremental Lifetime Excess Cancer Risk
$\mu\text{g/L}$	micrograms per liter
mg/kg	milligrams per kilogram
ND	not detected
NET	National Environmental Testing, Incorporated
NSA	Naval Support Activity (formerly Naval Air Station)
PCBs	polychlorinated biphenyls
PRE	Preliminary Risk Evaluation
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RR	risk ratio
SIP	Site Investigation Plan
SOUTHNAVFACENGCOM	Southern Division Naval Facilities Engineering Command
SSL	soil screening level
SVOC	semivolatile organic compound
SWMU	solid waste management unit
THQ	target hazard quotient
TR	target risk
USGS	U.S. Geological Survey

EXECUTIVE SUMMARY

The *Assembly C Site Investigation Plans* for Naval Support Activity Memphis proposed two phases of investigation for a Confirmatory Sampling Investigation (CSI) at Solid Waste Management Unit (SWMU) 26, the Building N-102 Battery Acid Neutralization Unit. The first phase consisted of a subsurface soil sampling investigation using Geoprobe equipment. Based on the results of the first phase, the second phase, consisting of installing and sampling soil borings and monitoring wells, is not required. This report summarizes the activities conducted during the CSI's first phase and resulting findings and conclusions.

During the first phase of the SWMU 26 CSI, subsurface soil samples collected from three intervals at four sample stations were analyzed for six metals (arsenic, cadmium, lead, mercury, nickel, and zinc.) Detected concentrations of metals were less than two times the background reference concentration (two times the mean background concentration) and/or United States Environmental Protection Agency soil screening levels.

To finalize the Resource Conservation and Recovery Act closure of the SWMU, one surface soil sample was collected immediately adjacent to the neutralization unit and analyzed for semivolatile organic compounds, pesticides/polychlorinated biphenyls, and Appendix IX metals. These sample results were used to prepare a Preliminary Risk Evaluation (PRE), which indicated the property is suitable for lease for either commercial or residential land use.

Based on the results of the first phase, no further action is recommended for SWMU 26.

1.0 INTRODUCTION

As part of the U.S. Navy Installation Restoration Program, the following Confirmatory Sampling Investigation (CSI) report has been prepared for Solid Waste Management Unit (SWMU) 26, the N-102 Battery Acid Neutralization Unit, on the Northside of Naval Support Activity (NSA) Memphis, Millington, Tennessee. Figures 1-1 and 1-2 provide a vicinity map and aerial photograph of SWMU 26, respectively.

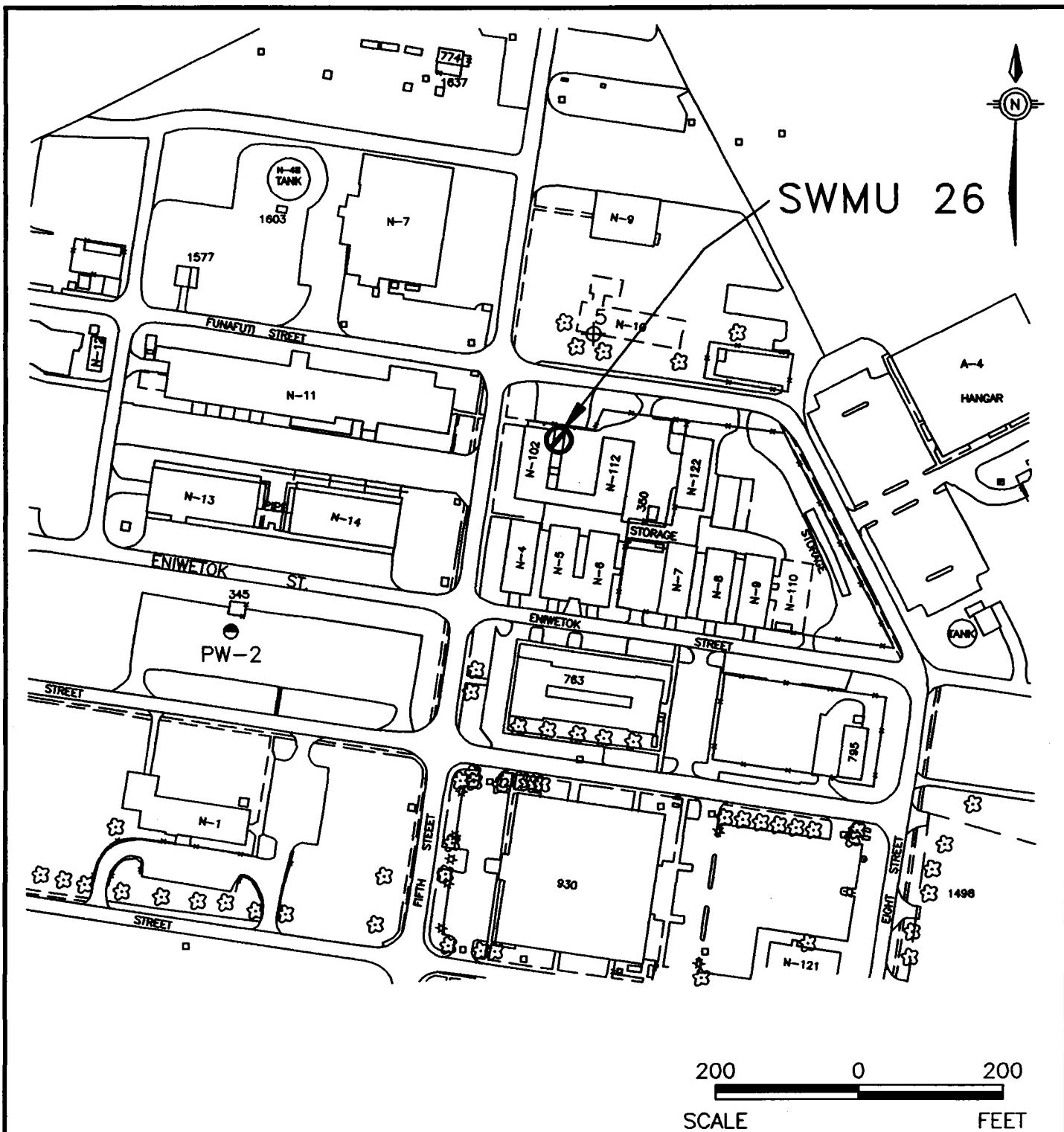
As a result of the Base Closure and Realignment Act of 1990 (BRAC), a portion of NSA Memphis, which includes SWMU 26, will be closed and prepared for transfer to the City of Millington. Eight SWMU assemblies (i.e., groups) have been defined for the NSA Memphis Resource Conservation and Recovery Act (RCRA) Corrective Action Program. Four of these assemblies (A, B, C, and D) are on closing portions of the base and have been categorized and ranked according to their BRAC status. SWMU 26 is in Assembly C, which is composed of five SWMUs requiring CSIs to confirm whether a release of contaminants has occurred and, if so, whether RCRA Facility Investigation (RFI) characterization will be required. The remaining four assemblies (E, F, G, and H) are on portions of the base that will remain open. The investigation, undertaken by EnSafe/Allen & Hoshall (E/A&H), adhered to the requirements of the Hazardous and Solid Waste Amendments portion (HSWA-TN002) of RCRA Permit No. TN2-170-022-600 and applicable regulations.

The *Assembly C Site Investigation Plans* (E/A&H, 1995) proposed two phases of investigation for the SWMU 26 CSI. The first phase consisted of a subsurface soil investigation using truck-mounted Geoprobe equipment to collect the samples. Based on the results of the first phase, a second phase, consisting of installing soil borings and monitoring wells, is not required. In addition, one surface-soil sample was collected and analyzed, and the results were used to prepare a Preliminary Risk Evaluation (PRE). The PRE indicates the property is suitable for lease for either residential or commercial land use.

This CSI report summarizes the activities conducted during the investigation's first phase and provides conclusions, including a recommendation for no further action.

Confirmatory Sampling Investigation Report
Assembly C — SWMU 26, N-102 Battery Acid Neutralization Unit
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996

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LEGEND

- 5 ⊕ USGS STRATIGRAPHIC TEST HOLE
- PW-2 ● PRODUCTION WELL



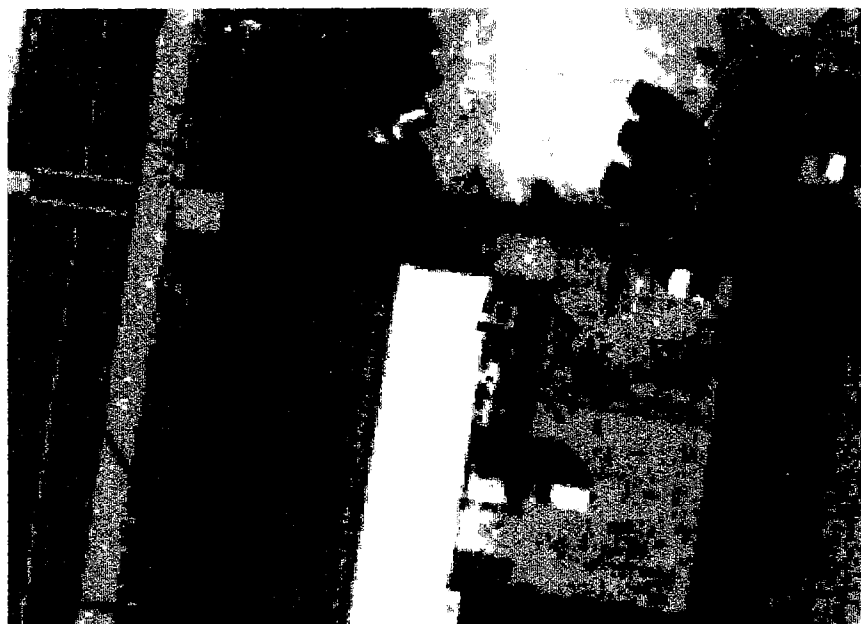
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NSA MEMPHIS
MILLINGTON, TN

FIGURE 1-1
VICINITY MAP
BUILDING N-102
BATTERY ACID NEUTRALIZATION UNIT
SWMU 26

DWG DATE: 10/27/95 | DWG NAME: 94RVM26

Confirmatory Sampling Investigation Report
Assembly C — SWMU 26, N-102 Battery Acid Neutralization Unit
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996

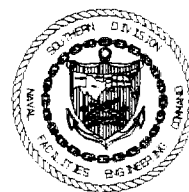
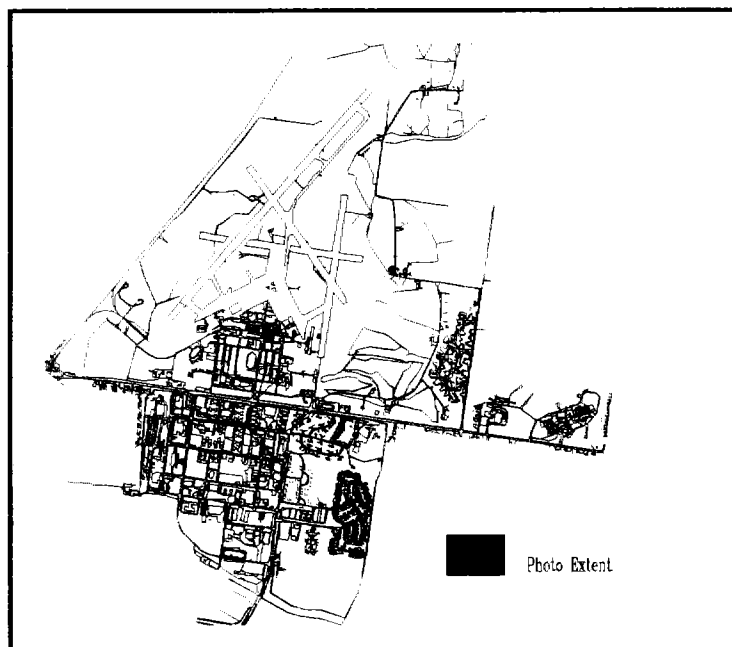
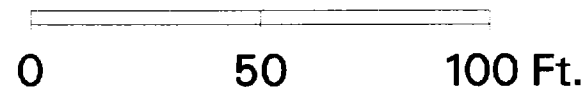
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SWMU 26 BOUNDARY



Photograph Scale



RCRA FACILITY INVESTIGATION NSA MEMPHIS MILLINGTON, TENNESSEE

FIGURE 1-2 DIGITAL ORTHOPHOTOGRAPH N-102 BATTERY ACID NEUTRALIZATION UNIT SWMU 26

AML: hcrs01/Am/Amvshille_01/

2.0 SITE DESCRIPTION AND HISTORICAL INFORMATION

2.1 Site Description

SWMU 26 is the site of an inactive, subsurface acid neutralization unit that was installed in 1980 and used in conjunction with the Building N-102 Battery Shop, adjacent and immediately southwest of the SWMU. Building N-102 is on the southeast corner of Funafuti Street and Fifth Avenue on the Northside of NSA Memphis. Figure 2-1 provides a site map of SWMU 26.

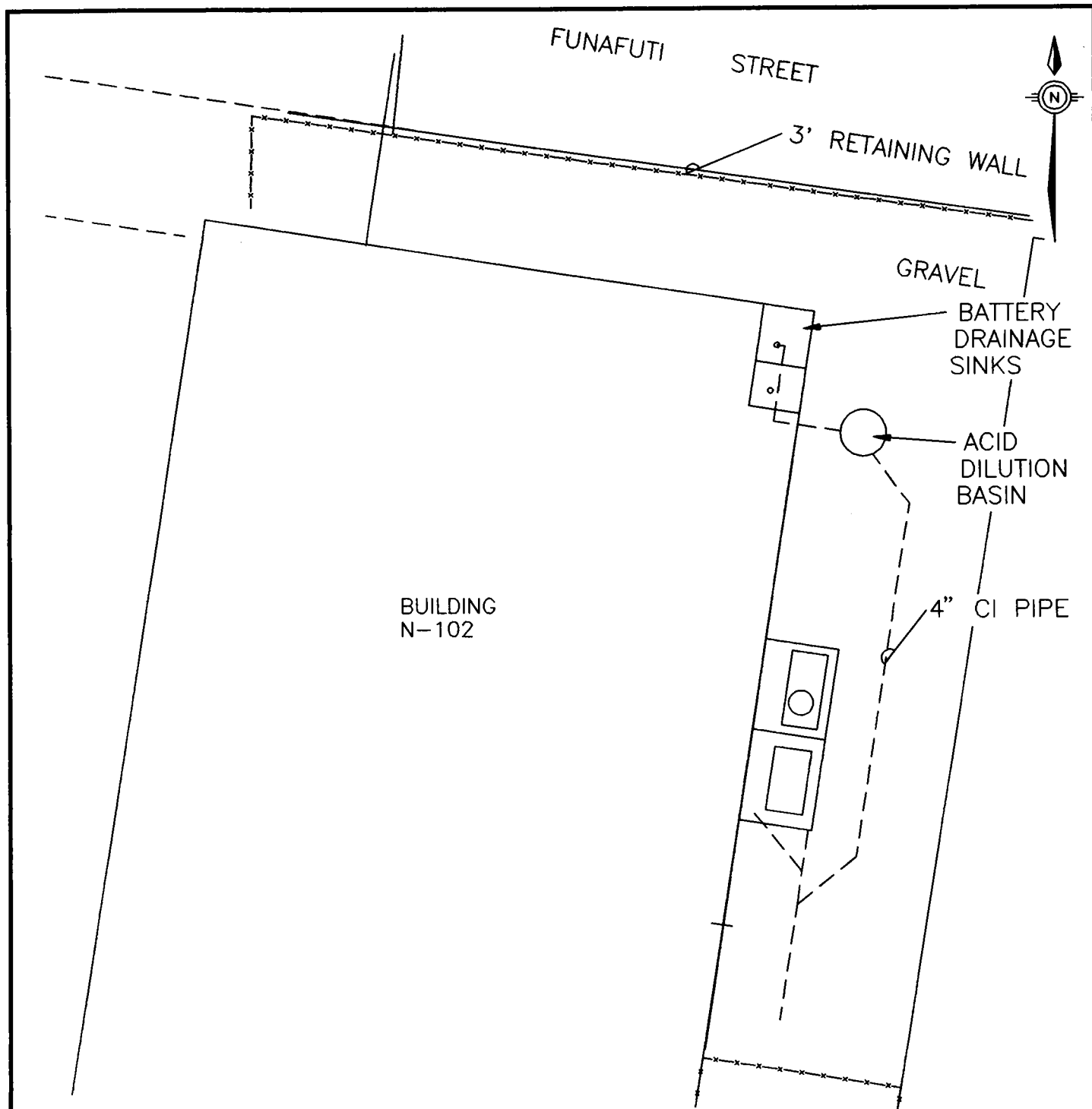
The neutralization unit is in a grassy area between Building N-102 and a sidewalk which runs along the length of the building. The area between Building N-102 and the adjacent Building N-122 to the east is elevated and paved, with a retaining wall facing Funafuti Street to the north. The street is approximately 3 feet below the paved area. The neutralization unit, covered by a 6-inch thick concrete pad and a 3-foot diameter manhole on the surface, is constructed of two 3-foot long by 3-foot diameter reinforced concrete pipes set in a 6-inch thick concrete base pad. The site drains to the southwest into the SWMU 4 storm sewer and drainage ditch, which is approximately 1,000 feet south of SWMU 26 at its closest point. Water in SWMU 4 eventually empties into the North Fork Creek.

2.2 Historical Site Operations

The N-102 Battery Acid Neutralization Unit received drainage from a pair of lead sinks along the inside wall of the northeast corner of Building N-102. It was designed to neutralize drained battery acid and flush water prior to discharge into the sanitary sewer system. During its operation, the unit was pumped, and its crushed limestone (sodium carbonate) was replenished every six months to maintain the system's effectiveness. Figure 2-2 provides a construction schematic of the neutralization unit. The neutralization unit was bypassed in 1992, when the Naval Environmental Inspection Team indicated that it might qualify as a potential hazardous waste site.

Confirmatory Sampling Investigation Report
Assembly C — SWMU 26, N-102 Battery Acid Neutralization Unit
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996

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----- UNDERGROUND PIPING

10 0 10

SCALE FEET



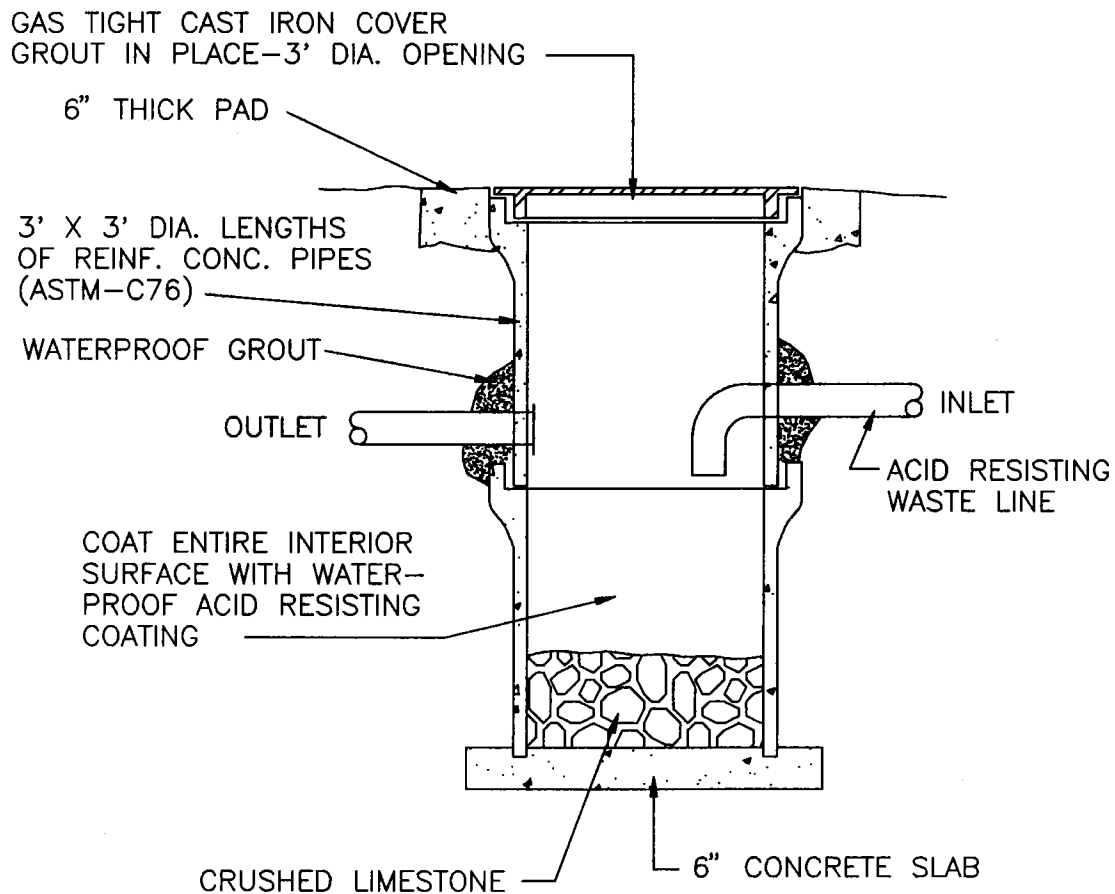
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MILLINGTON, TN

FIGURE 2-1
SITE MAP
BUILDING N-102
BATTERY ACID NEUTRALIZATION UNIT
SWMU 26

DWG DATE: 10/10/95 DWG NAME: 94SM26

Confirmatory Sampling Investigation Report
Assembly C — SWMU 26, N-102 Battery Acid Neutralization Unit
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996

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 NSA MEMPHIS
 MILLINGTON, TN

FIGURE 2-2
 CONSTRUCTION DETAILS
 BUILDING N-102
 BATTERY ACID NEUTRALIZATION UNIT
 SWMU 26

DWG DATE: 05/22/96 DWG NAME: 94CD26

Confirmatory Sampling Investigation Report
Assembly C — SWMU 26, N-102 Battery Acid Neutralization Unit
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996

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3.0 PRELIMINARY INVESTIGATIONS

No adverse conditions were identified in a Visual Site Inspection of the unit conducted in 1990 (ERC/EDGE, 1990). The neutralization unit was bypassed in 1992 when the Naval Environmental Inspection Team indicated that it might qualify as a potential hazardous waste site. A sample collected from its contents (liquid/solid) on June 29, 1992, was analyzed for Toxicity Characteristic Leaching Procedure metals, base-neutral/acid extractable organic compounds, and volatile organic compounds. Results of the analyses indicate constituent concentrations within the tank were below regulatory levels for disposal as a hazardous waste. Appendix A contains a copy of the analytical report.

Confirmatory Sampling Investigation Report
Assembly C — SWMU 26, N-102 Battery Acid Neutralization Unit
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996

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4.0 FIELD INVESTIGATIONS AND METHODOLOGY

The CSI soil and groundwater sampling program was intended to confirm the absence or presence of contaminants associated with past activities at SWMU 26. Specifically, the CSI objectives were:

- Determine the status and impact of the acid neutralization unit.
- Determine the potential for subsurface soil contamination in the loess.
- Determine the potential for groundwater contamination in the loess.
- Determine the suitability of the property for leasing by preparing a PRE.

This section summarizes the soil sampling tasks during the first phase of the CSI, which was conducted using a hand auger to collect a surface soil sample and Geoprobe equipment for subsurface soil sampling. The field sampling activities followed the procedures outlined in the U.S. Environmental Protection Agency (USEPA)- and Tennessee Department of Environment and Conservation-approved *Comprehensive RFI Work Plan* (E/A&H, 1994) and *Assembly C Site Investigation Plans* (E/A&H, 1995). Sample location descriptions and the rationale for sampled intervals are presented in Sections 4.1 and 4.2, respectively, of this CSI report. Section 4.3 presents the specific sampling protocols (sample processing, labeling, and chain-of-custody documentation).

Analytical Parameters

One surface soil sample was collected and analyzed to prepare a PRE to determine the suitability of the property for leasing. This sample was shipped to the National Environmental Testing, Inc. (NET) laboratory in Bedford, Massachusetts, and analyzed for semivolatile organic compounds (SVOCs) by USEPA Method 8270, chlorinated pesticides/polychlorinated biphenyls (PCBs) by USEPA Method 8080, and Appendix IX Metals by USEPA Method 6010/7000 series using a Level IV-equivalent Data Quality Objective (DQO).

Twelve subsurface soil samples were collected in the Geoprobe investigation to determine the nature and extent of contamination by specific metals associated with battery acid neutralization at SWMU 26. Each sample was shipped to NET for the analyses of arsenic, cadmium, lead, mercury, nickel, and zinc by USEPA Method 6010/7000 series using a Level III-equivalent DQO for 95% of the samples and a Level IV-equivalent DQO for the remaining 5% of the samples.

E/A&H validated the analytical results of the surface soil sample. Validata Chemical Services, Inc., of Norcross, Georgia, validated the analytical results of the subsurface samples. Attachment 1 contains the validation report, which indicates the overall data quality of the analytical work is satisfactory.

Hand-Auger Sampling Methods

E/A&H collected a surface soil sample at SWMU 26 using a 3-inch diameter, stainless-steel hand auger. The hand auger was advanced from land surface to a depth of 1 foot below land surface (bls) using a clockwise motion. The soil collected in the auger was placed in a stainless-steel bowl for processing.

Geoprobe Sampling Methods

E/A&H conducted a Geoprobe investigation at SWMU 26 to obtain subsurface soil samples for metals analyses. Tri-State Testing Services, Inc., of Memphis, Tennessee, collected the subsurface soil samples using a truck-mounted hydraulically-driven, Geoprobe® soil sampling system. Samples were obtained by advancing a 1-inch diameter soil probe to the desired sampling depth. The 48-inch sampler, situated at the end of the probe, contained a "push point" which retracted when the desired sampling interval was reached. The sampler was then advanced through the sampling interval. The soil sample was then retrieved from the borehole and the collected material removed from the sampler. The samples were collected in

a stainless-steel sampler lined with an acetate sleeve, which minimized sample handling and maintained sample integrity.

4.1 Investigation of Surface and Subsurface Soil

Surface Soil Investigation

One surface soil sample was proposed in Revision 0 of the *Assembly C Confirmatory Sampling Investigation Report* (E/A&H, November 1995). The sample was collected immediately adjacent and south of the former neutralization unit. Figure 4-1 shows the surface soil sample location.

Subsurface Soil Investigation

Four subsurface sampling locations were proposed in the *Assembly C Site Investigation Plans* (E/A&H, 1995) to define the nature and extent of contamination, if any, associated with the N-102 Acid Neutralization Unit. Three of the locations border the former neutralization tank, and the fourth is along Funafuti Street, in a presumed upgradient location. Figure 4-1 shows the subsurface soil sampling locations.

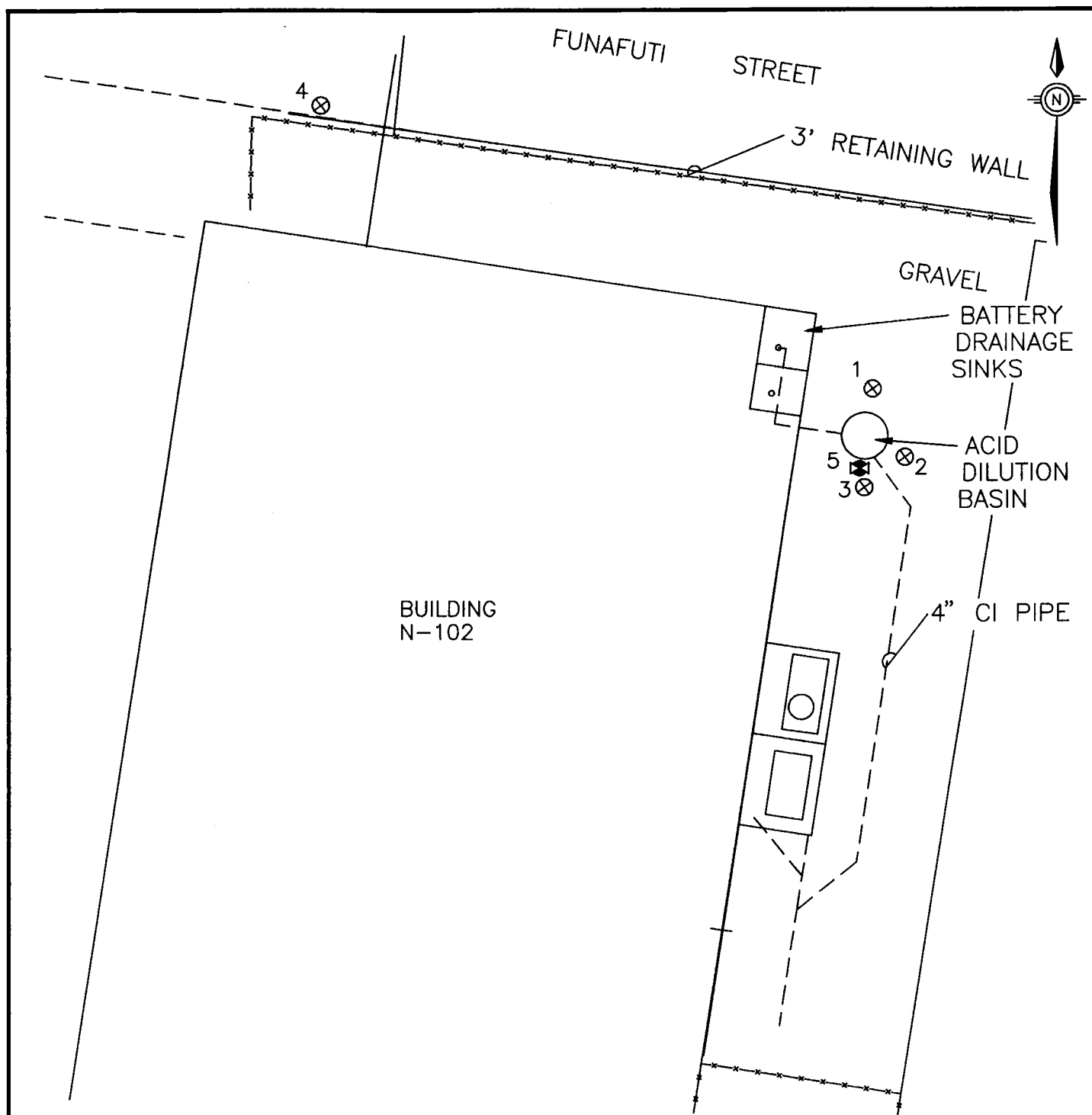
4.2 Sampling Rationale and Methods

Surface Soil

Revision 0 of the *Assembly C Confirmatory Sampling Investigation Report* stated that one surface soil sample would be collected from 0- to 1-foot bls (surface interval) immediately adjacent to the neutralization unit. The sample was collected with a decontaminated stainless-steel hand auger and immediately placed in a stainless-steel bowl and homogenized using a stainless-steel spoon in accordance with Section 4.2.10 of the Region IV USEPA *Standard Operating Procedures/Quality Assurance Manual* and containerized as outlined in Section 4.4.4 of the *Comprehensive RFI Work Plan*. After containerization, all samples were immediately placed on ice for transport to the offsite laboratory.

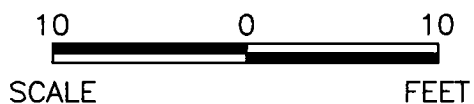
Confirmatory Sampling Investigation Report
Assembly C — SWMU 26, N-102 Battery Acid Neutralization Unit
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996

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LEGEND

- 3 ⊗ GEOPROBE SUBSURFACE SOIL SAMPLE LOCATION
- 5 ⊠ HAND AUGER SURFACE SOIL SAMPLE LOCATION



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FIGURE 4-1
SOIL SAMPLE LOCATIONS
BUILDING N-102
BATTERY ACID NEUTRALIZATION UNIT
SWMU 26

DWG DATE: 05/17/96 DWG NAME: 94SSL26

Confirmatory Sampling Investigation Report
Assembly C — SWMU 26, N-102 Battery Acid Neutralization Unit
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996

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Subsurface Soil

The *Assembly C Site Investigation Plans* stated that the following samples would be collected from each Geoprobe location during the CSI:

- One subsurface soil sample from the 3- to 4-foot interval just below the unit's piping,
- One subsurface soil sample from the 6- to 7-foot interval, just below the base of the unit,
- One soil or groundwater sample from the soil/water interface in the loess

To determine the actual intervals to be sampled, the first Geoprobe boring (Location 1) was sampled continuously to 18 feet bls, where a sandy clay interval was encountered (soil/water interface); however, no groundwater samples could be collected from the loess. Based on field observations, the following intervals were selected for CSI sampling:

- One subsurface soil sample from the 3- to 4-foot interval just below the unit's piping,
- One subsurface soil sample from the 4- to 8-foot interval to provide information surrounding and beneath the unit, and
- One subsurface soil sample from the 16- to 18-foot interval, corresponding to the soil/water interface in the loess.

An exception to the above sampling strategy occurred at Location 4, where the deepest soil sampling interval was 13 to 15 feet due to a subsurface obstruction. An E/A&H geologist logged and processed the soil samples for submittal to the analytical laboratory. Tri-State collected the soil samples with the Geoprobe rig using the 1-inch diameter soil probe lined with an acetate sleeve. Each sample was placed in a stainless-steel bowl and homogenized using a stainless-steel spoon in accordance with Section 4.2.10 of the Region IV USEPA *Standard Operating Procedures/Quality Assurance Manual* and containerized as outlined in Section 4.4.4

of the *Comprehensive RFI Work Plan*. After containerization, all samples were immediately placed on ice for transport to the offsite laboratory.

The sampling protocol for surface and subsurface soil adhered to the approved *Comprehensive RFI Work Plan* and the *Assembly C Site Investigation Plans*. Sample handling was minimized. When transferring material from the sampling device to containers, the operation was conducted expediently, in as clean an environment as possible. A new pair of disposable gloves was donned before collecting each subsurface soil sample. Empty containers were kept packaged until used, at which time they were immediately chilled and isolated in coolers.

4.3 Sample Processing and Chain-of-Custody Procedure

All samples collected in the field were labeled with a 10-digit alphanumeric code identifying the site, sample type, sample location, and interval. The first three digits identify the site location, and the fourth digit identifies the sample matrix. The next four digits identify the sampling location, and the last two digits are the deepest point of the sampling interval. For example, the sample label "026S000318" designates a SWMU 26 soil sample collected from Location 3 at a maximum depth of 18 feet.

Clean sample containers provided by the testing laboratory were shipped to E/A&H in sealed packages. Sample containers were labeled with the sample identification number, date, sampler's name, and requested analytical parameter, then placed in a cooler immediately following collection. Each sample was logged in the field logbook. Samples for offsite laboratory analysis were prepared for shipment by wrapping each container individually in bubble wrap, placing it in a resealable plastic bag, and packing it on ice inside a sturdy cooler. Cooler lids were secured with packing tape and sealed with signed custody seals. Packaged samples were then shipped overnight via FedEx priority service for next morning delivery. The offsite laboratory was notified the day of shipment of the number of samples submitted. All

sample shipments were reported to have arrived at NET in good condition and at the appropriate temperature.

To ensure the integrity of the sample transfer process, a strict chain-of-custody procedure was implemented. This procedure was initiated in the field for each sampling event and conducted through custody transfer to the analytical laboratory. A chain-of-custody form was completed for each batch of samples, itemizing sample numbers, containerization, preservatives, analyses requested, date and time of sampling, and FedEx shipping number. Custody transfers were recorded by signature, date, and time of relinquishment, and receipt of custody by the parties involved.

4.4 Grouting Procedures

Tri-State filled each Geoprobe boring with neat cement grout following sample collection.

4.5 Decontamination Procedures

Tri-State decontaminated its downhole field equipment which did not come in contact with the samples (i.e., rods, split-spoons) with a nonphosphate detergent and a deionized, organic-free water rinse. All downhole equipment and sampling tools which could potentially contact the collected samples were decontaminated before and after each use in accordance with guidelines set forth in the *Assembly C Site Investigation Plans*, which consisted of the following steps:

- Wash with a hot soap and water mixture
- Rinse with potable water
- Rinse with deionized organic-free water
- Rinse twice with pesticide-grade isopropyl alcohol
- Rinse with deionized organic-free water
- Wrap with aluminum foil or plastic

A new pair of disposable nitrile gloves was donned before handling decontaminated sampling equipment. Because subsurface soil samples were collected directly from the acetate sleeves within the stainless-steel sampler, and the surface soil sample was collected directly from the hand auger, the CSI generated no investigation-derived waste.

5.0 GEOLOGY AND HYDROGEOLOGY

5.1 Regional Geology and Hydrogeology

The general hydrogeology of the Memphis area is discussed in detail in Section 2.11 and a conceptual model of the hydrogeology at the NSA is presented in Section 2.12 of the *Comprehensive RFI Work Plan* (E/A&H, 1994). Updated information is available in the *Hydrogeology of Post-Wilcox Group Stratigraphic Units in the Area of the Naval Air Station Memphis, Near Millington, Tennessee* (Kingsbury and Carmichael, 1995), provided in Attachment 2 of this document. On the basis of this updated information, the hydrogeology of NSA Memphis is re-summarized below.

The two stratigraphic units investigated during the RFIs at NSA Memphis are the loess/alluvial deposits of Pleistocene and Holocene age and the underlying fluvial deposits of Pleistocene to Pliocene age. The loess — eolian deposits consisting of silt, silty clay, clay, and minor amounts of sand — is the principal unit occurring at land surface throughout the NSA Memphis Northside. Alluvium, which is restricted to stream valleys, includes alluviated or reworked loess. The loess is typically 0 to 65 feet thick in the Memphis area; at NSA Memphis it ranges from 15 to 45 feet thick (USGS, 1995). Water-bearing zones are present in the loess primarily in the upper part of this unit; however, yields are low and water quality analyses performed during the water use survey portion of previous underground storage tank investigations indicate that loess groundwater does not meet many primary and secondary drinking water standards. Previous investigations at NSA Memphis have found depth to water in the loess varying between 5 and 15 feet bls and vertical hydraulic conductivities to range from 10^{-6} to 10^{-8} centimeter per second (cm/sec). Although the loess may be considered an aquitard on the basis of the relatively low hydraulic conductivities, this shallowest water-bearing zone is present within this interval. Groundwater flow in the loess is primarily downward, although locally some groundwater in the loess may discharge to nearby streams, drainage ditches, and other surface water bodies.

The fluvial deposits underlie the loess in upland areas and consist of sand, gravel, and some clay, with thin layers of ferruginous sandstone and conglomerate at the base. This unit ranges in thickness from 0 to 100 feet in the Memphis area; on the Northside of NSA Memphis it ranges from 10 to 60 feet thick and represents the most significant component of the surficial aquifer. Many shallow domestic wells in the Memphis rural areas are completed in the fluvial deposits. Relative groundwater elevations between wells completed in the loess/alluvium and fluvial deposits indicate semiconfined to confined conditions in the fluvial deposits. Typically a downward vertical gradient exists between water in the loess and the fluvial deposits. Sediments in the fluvial deposits generally coarsen with depth, and typically, the upper portion consists of a mixture of very fine sand with varying degrees of silt and clay and becomes increasingly less silty with depth, grading into a fine to medium sand near the middle of the unit. Grain sizes typically coarsen below this interval, grading into a gravelly sand near the fluvial deposits basal section.

The fluvial deposits are underlain by the Cockfield Formation, a part of the Jackson-upper Claiborne confining unit, which is a heterogeneous formation consisting of very fine silty sand interbedded with clay and silt lenses or clay with interbedded fine sand lenses. The Cockfield Formation ranges in thickness from approximately 35 to 180 feet in the NSA Memphis area. The more-permeable characteristics of the fluvial deposits, compared to the relatively impermeable properties of the overlying loess/alluvium and the underlying Jackson-upper Claiborne confining unit, result in the fluvial deposits being the preferential zone of groundwater flow and the route for contaminant transport in NSA Memphis's subsurface.

5.2 Site-Specific Geology and Hydrogeology

The following sections provide site-specific geologic and hydrogeologic information obtained from stratigraphic test borings, the Assembly A RFI investigation, and the SWMU 26 Geoprobe investigation.

Stratigraphic Test Borings

In 1994, the U.S. Geological Survey (USGS) drilled and sampled stratigraphic test hole 5, approximately 175 feet north-northeast of SWMU 26. Figure 1-1 shows the location of test hole 5. Attachment 2 of this document contains a copy of the previously referenced Kingsbury and Carmichael publication, which provides a geologic cross-section showing test hole 5 (USGS designation Sh:V-76). Stratigraphic test hole 5 was drilled 32 feet into the Cook Mountain Formation to better understand the site geology before monitoring well installations. Cuttings from the test hole were visually logged by a field geologist during drilling, and the test hole was geophysically logged to its total depth following completion. Stratigraphy and lithologies encountered in the test hole are as follows:

Loess:	Approximately 30 feet of windblown silt and clay deposits.
Fluvial Deposits:	Approximately 54 feet of sand and gravel.
Cockfield Formation:	Approximately 104 feet of alternating sand and clay with some lignite.
Cook Mountain Formation:	Characterized as a light olive-gray to greenish-gray dense clay. Defined as the upper confining unit between the surficial aquifers and the Memphis Aquifer. Because the stratigraphic test hole was only advanced 32 feet into the Cook Mountain Formation, the entire thickness is not known.

Previous Investigations

Subsurface soil information was collected during the Assembly A RFI for SWMU 7, the Building N-126 Plating Shop Dry Well. SWMU 7 is approximately 900 feet west of SWMU 26. During the Assembly A investigation, nine monitoring-well clusters (designated 07MW01 through 07MW09) were installed at various locations around SWMU 7. Monitoring well clusters 07MW02, 07MW03, and 07MW06 are the closest to SWMU 26 (between 650 and 800 feet west and northwest). The general lithology encountered in the soil borings associated with these three clusters is as follows:

- Clayey silt, silty clay, and sandy clay from ground surface to between 25 and 34 feet bls (loess).
- Sand with gravel and silty clayey sand from between 25 and 34 feet bls to between 77 and 82 feet bls (fluvial deposits).
- Silty clayey sand, silty sand with clay lenses, clay with sand lenses, and lignite from between 77 and 82 feet to the termination depth of the boring (between 101 and 125 feet [Cockfield Formation]).

Laboratory-measured vertical hydraulic conductivities for the subsurface soil samples associated with the SWMU 7 monitoring wells are as follows:

Well Cluster	Associated Soil Sample ID	Sampling Depth (in feet)	Conductivity (in cm/sec)
07MW01	07S000177	75' to 77' (lower fluvial deposits)	6.8×10^{-5}
	07S0001112	110' to 112' (Cockfield Formation)	4.1×10^{-8}
07MW03	07S0003117	115' to 117' (Cockfield Formation)	1.6×10^{-8}
07MW08	07S0008127	125' to 127' (Cockfield Formation)	8.7×10^{-7}
07MW09	07S000922	10' to 22' (loess)	9.5×10^{-7}

Monitoring well cluster 07MW01 is approximately 750 feet west-northwest of SWMU 26. Monitoring-well clusters 07MW03, 07MW08, and 07MW09 are 600 feet west-northwest, 1,100 feet west, and 1,050 feet west-northwest of SWMU 26, respectively. The boring logs and hydraulic conductivity data sheets for SWMU 7 are provided in Attachment 2.

Based on the topography, the information contained in the conceptual model of the NSA Memphis hydrogeology (Section 2.12 of the *Comprehensive RFI Work Plan*), recent data collected during investigations at Assembly A SWMUs, and communication with USGS representatives, groundwater in the fluvial deposits flows locally toward the north-northeast. Groundwater flow in the loess is primarily downward, although locally, some groundwater in the loess may discharge to nearby streams, drainage ditches, and other surface water bodies.

SWMU 26 CSI

The deepest Geoprobe soil boring at SWMU 26 terminated at 18 feet bls. The E/A&H geologist described the lithology encountered during the Geoprobe investigation as a brown clayey silt (loess). The water-bearing zone in the loess (18 feet bls) was visually classified as a sandy clay.

Confirmatory Sampling Investigation Report
Assembly C — SWMU 26, N-102 Battery Acid Neutralization Unit
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996

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6.0 NATURE AND EXTENT OF CONTAMINATION

This section presents the analytical results for surface soil (0' to 1' bls) and subsurface soil (> 1' bls) samples collected during the CSI. One surface soil sample was collected and analyzed for SVOCs, pesticides/PCBs, and Appendix IX metals. Twelve subsurface soil samples (three intervals at four sampling locations) were collected and analyzed for the following six metals: arsenic, cadmium, lead, mercury, nickel, and zinc.

Detected concentrations of organic compounds and metals have been compared with media-specific guidance concentrations from the USEPA Region III Risk-Based Concentration (RBC) Table (July to December 1995) to evaluate the risk associated with exposure to soil contaminants and to evaluate the transfer potential of contaminants from soil to groundwater. In addition, inorganic concentrations for the soil samples are compared with established reference concentrations (RCs) derived from background samples at NSA Memphis to determine if they represent naturally occurring concentrations. Background RC calculations were provided in the *Technical Memorandum — Assemblies A through D Background Reference Concentrations*, E/A&H, September 18, 1996).

Specifically, surface soil sample results are compared with RCs, residential and industrial RBCs, and soil screening levels (SSLs); whereas subsurface soil sample results are compared with RCs and SSLs only.

Section 6.1 briefly discusses the criteria used to determine the RCs (two times the mean background concentration) for inorganics. Section 6.2 summarizes the detected contaminants in soil compared with the respective RBC and/or SSL values. Section 6.3 summarizes the contaminants detected at SWMU 26. Contaminants identified in surface soil are further evaluated in the Preliminary Risk Evaluation (Section 7).

6.1 Background and Reference Criteria

Background locations were established at five areas at NSA Memphis (shown on Figure 6-1) to determine ambient soil and groundwater quality conditions. Background data for soil consist of 12 samples collected from five boring locations. The background RC for each inorganic was calculated by doubling the mean concentration detected. Two RCs were established for soil — one for surface soil (0 to 1 foot bls) for use in preliminary risk evaluation and one for subsurface soil (> 1 foot bls) to evaluate the excess risk associated with exposure to the detected element in soil and to determine if it occurs naturally. Tables 6-1 and 6-2 show the RCs for surface soil and subsurface soil, respectively.

6.2 Soil Sample Analytical Results

The following sections summarize the results of soil samples collected during the CSI. Appendix B contains the analytical data.

6.2.1 Surface Soil

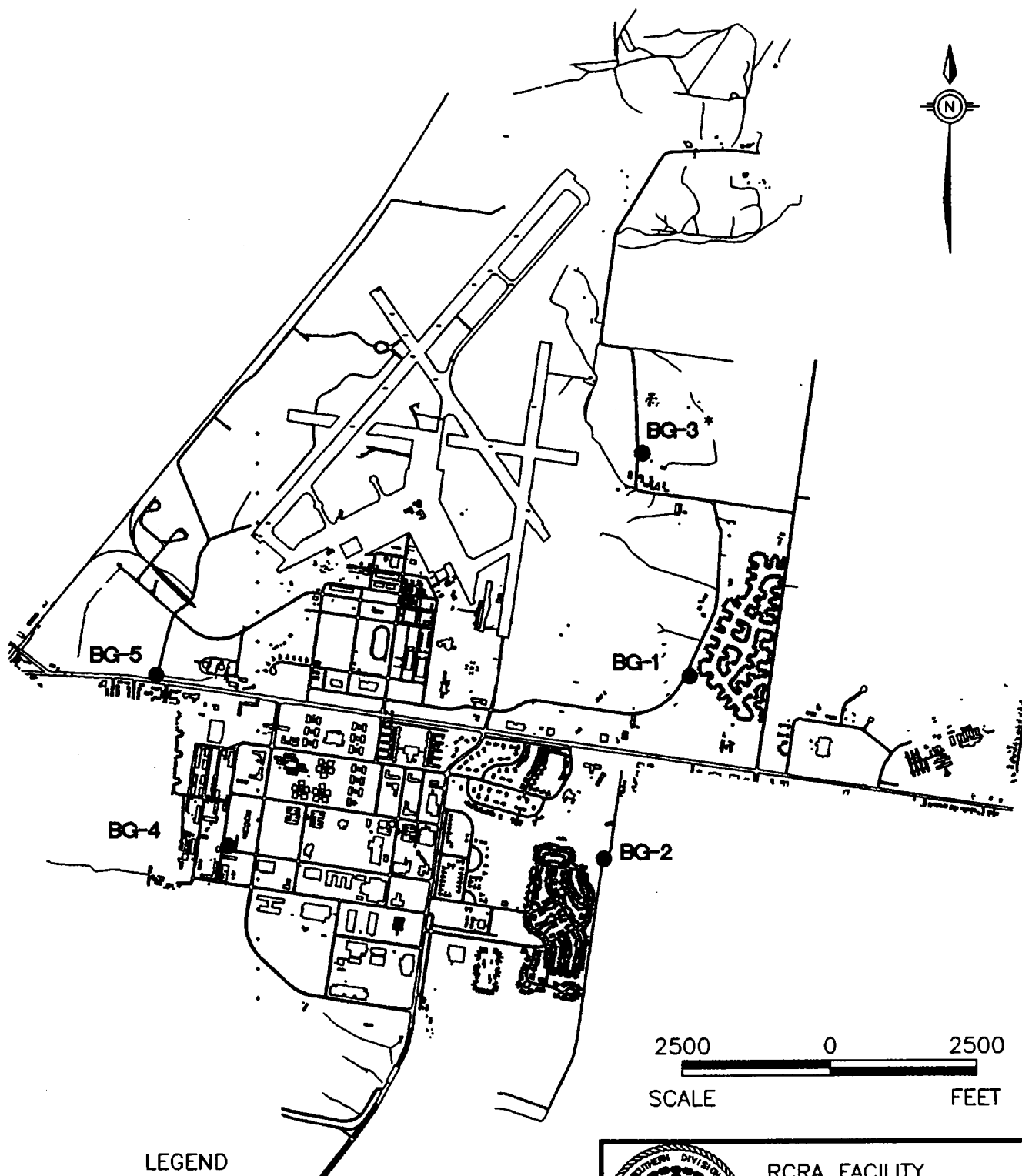
One surface soil sample was collected and analyzed for pesticides/PCBs, SVOCs, and Appendix IX metals. Figure 4-1 shows the surface soil sample location.

Pesticides/PCBs

No pesticides or PCBs were detected in the surface soil sample.

SVOCs

Eleven SVOCs were detected in the surface soil sample (refer to Table 6-1); however none of the SVOCs exceeded the applicable SSLs. Only one SVOC, benzo(a)pyrene at 0.099 milligrams per kilogram (mg/kg), exceeded the residential RBC (0.088 mg/kg), but did not exceed the industrial RBC (0.78 mg/kg).



LEGEND

* SOIL BACKGROUND DATA ONLY

BG-2 BACKGROUND LOCATION 2

NOTE: SOIL DATA CONSIST OF ONE SURFACE & TWO SUBSURFACE SOIL SAMPLES. GROUNDWATER DATA CONSIST OF THREE SAMPLES; THE LOESS, UPPER FLUVIAL & LOWER FLUVIAL DEPOSITS.



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FIGURE 6-1
SOIL & GROUNDWATER
BACKGROUND LOCATIONS

DWG DATE: 10/05/95 DWG NAME: 94SGBL

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Confirmatory Sampling Investigation Report
Assembly C — SWMU 26, N-102 Battery Acid Neutralization Unit
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996

Table 6-1
Detected Concentrations of Metals, Pesticides, and SVOCs in Surface Soil
SWMU 26 — Building N-102 Battery Acid Neutralization Unit
(data in milligrams per kilogram)

Analyte	Sample Location/ID				
	5 (0 - 1') 026S000501	RC ^a 0 - 1'	SSL ^b	RBC ^c Residential	RBC ^c Industrial
Metals					
Antimony	ND ^d	ND	—	31	820
Arsenic	5.7	13.2	15	0.43	3.8
Barium	82.8	191	32	5,500	140,000
Beryllium	0.53 J ^e	0.96	180	0.15	1.3
Cadmium	ND	ND	6	39	1,000
Chromium	15.2 J	26.4	19	390	10,000
Cobalt	8.5 J	20.6	—	4,700	120,000
Copper	ND	27	—	3,100	82,000
Lead	19.5	28.7	None ^f	None ^f	None ^f
Mercury	ND	2.3	3	23	610
Nickel	21.8	ND	21	1,600	41,000
Selenium	ND	ND	3	390	10,000
Silver	1.6 J	ND	—	390	10,000
Vanadium	25	49.6	—	550	14,000
Zinc	65.1	88.3	42,000	23,000	610,000
Tin	ND	ND	—	47,000	1,000,000
Organic Compounds					
Phenanthrene	0.12 J	—	1,400 ^g	2,300 ^g	61,000 ^g
Fluoranthene	0.22 J	—	980	3,100	82,000
Pyrene	0.19 J	—	1,400	2,300	61,000
Benzo(a)anthracene	0.11 J	—	0.7	0.88	7.8
Chrysene	0.11 J	—	1	88	780
bis(2-Ethylhexyl)phthalate	0.061 J	—	11	46	410
Benzo(b)fluoranthene	0.11 J	—	4	0.88	7.8

Confirmatory Sampling Investigation Report
Assembly C — SWMU 26, N-102 Battery Acid Neutralization Unit
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996

Table 6-1
Detected Concentrations of Metals, Pesticides, and SVOCs in Surface Soil
SWMU 26 — Building N-102 Battery Acid Neutralization Unit
(data in milligrams per kilogram)

Analyte	Sample Location/ID				
	5 (0 - 1') 026S000501	RC ^a 0 - 1'	SSL ^b	RBC ^c Residential	RBC ^c Industrial
Organic Compounds					
Benzo(k)fluoranthene	0.089 J	—	4	8.8	78
Benzo(a)pyrene	0.099 J	—	4	0.088	0.78
Indeno(1,2,3-cd)pyrene	0.048 J	—	35	0.88	7.8
Benzo(g,h,i)perylene	0.051 J	—	1,400 ^s	2,300 ^s	61,000 ^s

Notes:

- ^a RC = Reference concentration (2 x the mean background concentration). Background concentrations were established for the 0 to 1-foot and the greater than 1-foot intervals below land surface using analytical data from 12 soil samples collected from five background soil boring locations at various locations on the Northside and Southside of NSA Memphis (*Technical Memorandum — Assemblies A through D Background Reference Concentrations*, E/A&H, September 18, 1996).
- ^b SSL = Soil Screening Level; obtained from the USEPA Region III Risk-Based Concentration Table, July - December, 1995.
- ^c RBC = Risk-based concentrations obtained from the USEPA Region III Risk-Based Concentration Table, July - December, 1995.
- ^d ND = denotes analyte was not detected.
- ^e J = denotes concentration is estimated.
- ^f = Although there is no published SSL or RBC for lead, USEPA has published a recommended soil screening concentration of 400 milligrams per kilogram (mg/kg) for residential land use and 1,000 mg/kg for industrial land use (Office of Solid Waste and Emergency Response Directive 9355.4-12).
- ^g = No RBCs exist for phenanthrene and benzo(g,h,i)perylene; the RBCs for pyrene were used as surrogates.

Bold indicates analyte exceeds the RC.

Italics indicates analyte exceeds the soil screening level.

Bold and Italics indicates analyte exceeds both the RC and the SSL.

LARGE PRINT indicates analyte exceeds the residential RBC.

Table 6-2
Detected Concentrations of Metals in Subsurface Soil
SWMU 26 — Building N-102 Battery Acid Neutralization Unit
(data in milligrams per kilogram)

Sample Location/ID								
Analyte	1 (3' - 4') 026S000104	1 (4' - 8') 026S000108	1 (16' - 18') 026S000118	2 (3' - 4') 026S000204	2 (4' - 8') 026S000208	2 (16' - 18') 026S000218	RC ^a (2 x Mean Background)	SSL ^b
Arsenic	ND ^c	5.1 J ^d	ND	9.0 J	3.8 J	ND	20.4	15
Cadmium	ND	ND	ND	ND	1.0 J	ND	6.8	6
Lead	6.3	7.6	5.0	7.8	6.1	5.8	25.1	None ^e
Nickel	11.8J	15.9 J	13.5 J	18.8 J	16.8 J	14.5 J	59.8	21
Zinc	29.2	32.3	17.7	42.0	31.6	15.1	111.8	42,000
Analyte	3 (3' - 4') 026S000304	3 (4' - 8') 026S000308	3 (16' - 18') 026S000318	4 (3' - 4') 026S000404	4 (4' - 8') 026S000408	4 (13' - 15') 026S000415	RC ^a (2 x Mean Background)	SSL ^b
Arsenic	6.6 J	ND	ND	3.9 J	7.3 J	ND	20.4	15
Cadmium	0.97 J	0.96 J	0.77 J	0.78 J	1.2 J	ND	6.8	6
Lead	5.9	7.4	7.01	ND	5.2	6.5	25.1	None ^e
Nickel	18.5 J	15.8 J	11.1 J	19.9 J	16.4 J	11.4 J	59.8	21
Zinc	34.7	29.0	18.0	30.1	23.8	21.0	111.8	42,000

Notes:

- ^a RC = Reference concentration (2 x the mean background concentration). Background concentrations were established for the 0 to 1-foot and the greater than 1-foot intervals below land surface using analytical data from 12 soil samples collected from five background soil boring locations at various locations on the Northside and Southside of NSA Memphis (*Technical Memorandum — Assemblies A through D Background Reference Concentrations*, E/A&H, September 18, 1996).
- ^b SSL = Soil Screening Level; obtained from the USEPA Region III Risk-Based Concentrations Table, July to December 1995.
- ^c ND = Compound not detected.
- ^d J = Estimated concentration.
- ^e = Although there is no published SSL for lead, USEPA has published a recommended soil screening concentration of 400 milligrams per kilogram (mg/kg) for residential land use and 1,000 mg/kg for industrial land use (Office of Solid Waste and Emergency Response Directive 9355.4-12).

Appendix IX Metals

Ten Appendix IX metals were detected in the surface soil sample (refer to Table 6-1). The residential and industrial RBCs, 0.43 mg/kg and 3.8 mg/kg, respectively, were exceeded for arsenic (5.7 mg/kg), and the residential RBC (0.15 mg/kg) was exceeded for beryllium (0.53 mg/kg); however, these metals occur naturally at NSA Memphis and were detected at concentrations below their RCs (13.2 mg/kg and 0.96 mg/kg, respectively). The only metal that exceeded its surface soil RC and SSL was nickel (21.8 mg/kg; RC = not detected, SSL = 21 mg/kg); however, this metal did not exceed its residential RBC (1,600 mg/kg). Silver, detected at 1.6 mg/kg, also exceeded its RC (not detected); however, it did not exceed its residential RBC (390 mg/kg) and no SSL exists for comparison.

6.2.2 Subsurface Soil

Twelve subsurface soil samples were collected during the CSI. Three intervals were sampled at each of the four subsurface soil sampling locations shown on Figure 4-1. The samples were analyzed for the metals arsenic, cadmium, lead, mercury, nickel, and zinc. Table 6-2 summarizes the analytical results for the subsurface soil samples.

Metals

Five metals were detected in the subsurface soil samples: arsenic, cadmium, lead, nickel, and zinc. No mercury was detected in any sample. No detected metal exceeded either the RC for subsurface soil or the SSL.

6.3 Summary of Nature and Extent

Soil analytical results indicate minimal contamination at SWMU 26. As shown on Table 6-1, low concentrations of SVOCs were detected in the surface soil sample collected immediately south of the neutralization unit, possibly originating from storm water runoff from the adjacent asphalt parking lot. Only one SVOC, benzo(a)pyrene (0.099 mg/kg) exceeded its residential RBC (0.088 mg/kg); however, it did not exceed either its industrial RBC or its applicable SSL.

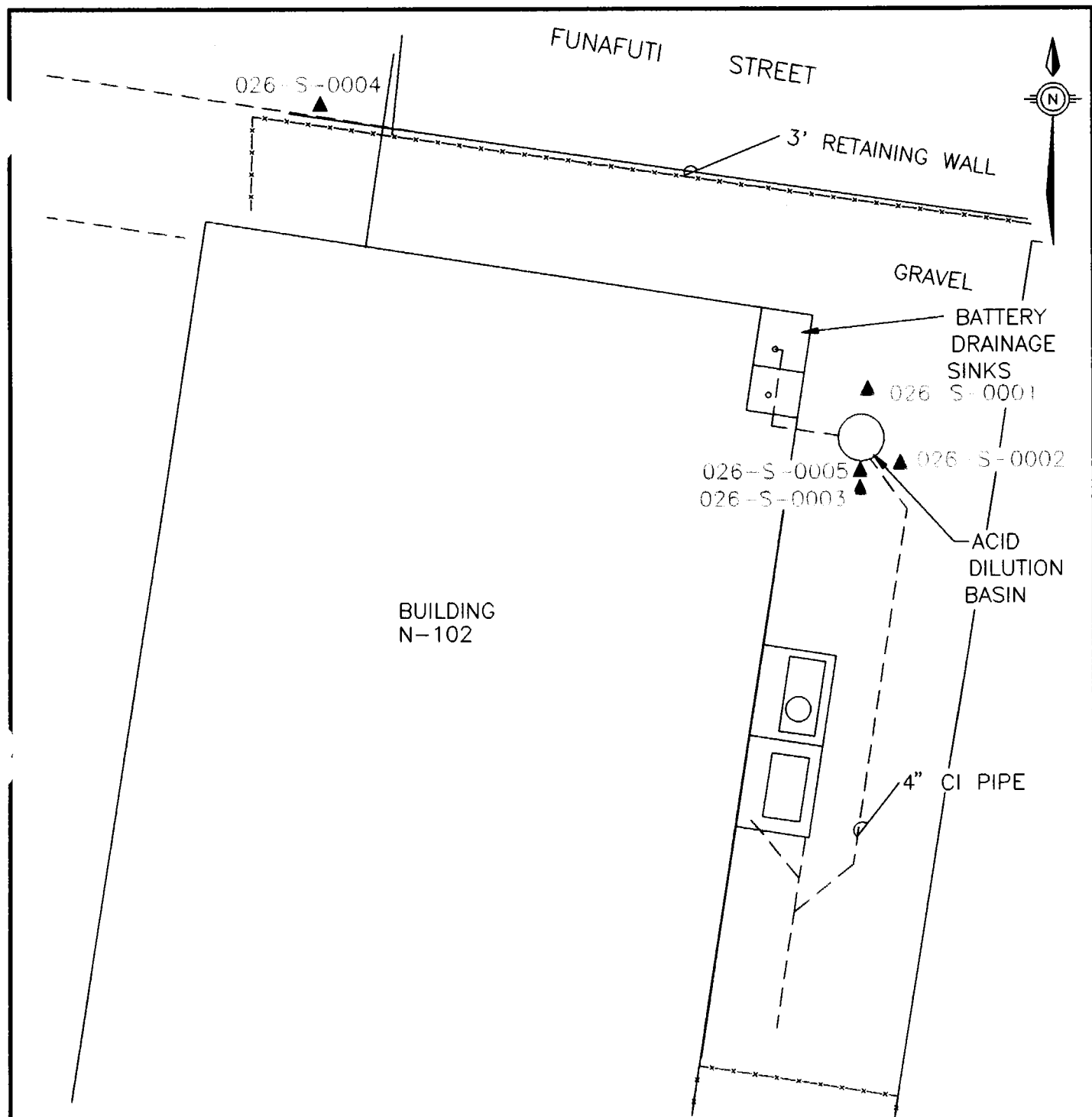
As shown on Figure 6-2, no contaminant detected in surface or subsurface soil exceeded its RC and residential RBC.

Contaminant Transfer from Soil to Groundwater

Tables 6-1 and 6-2 provide SSL values for transfer from surface and subsurface soil to groundwater, and Figure 6-3 illustrates the sample location where one or more contaminants exceeded both the RC and SSL. Figure 6-3 shows the only metal which exceeded the RC and SSL was nickel in the surface soil sample collected at location 5 (detected concentration = 21.8 mg/kg; RC = not detected, SSL = 21 mg/kg). It should be noted that nickel's RC for subsurface soil is 59.8 mg/kg.

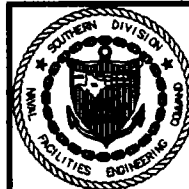
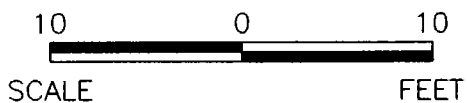
Confirmatory Sampling Investigation Report
Assembly C — SWMU 26, N-102 Battery Acid Neutralization Unit
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996

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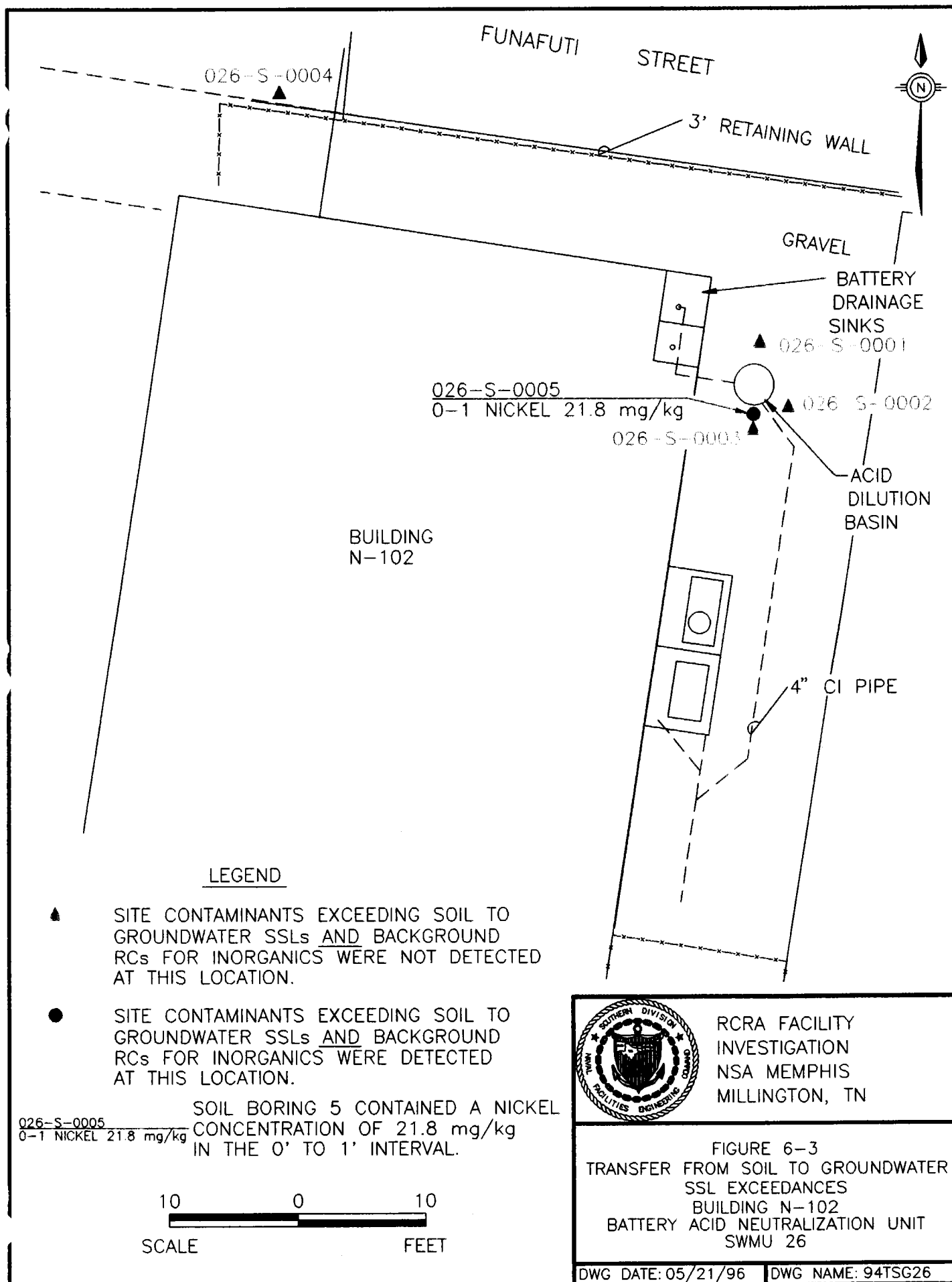
- ▲ CONTAMINANTS WERE NOT DETECTED OR NO SINGLE CONTAMINANT EXCEEDED THE RESIDENTIAL RBC AND THE BACKGROUND REFERENCE CONCENTRATION.



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FIGURE 6-2
SOIL CONTAMINANTS SUMMARY
BUILDING N-102
BATTERY ACID NEUTRALIZATION UNIT
SWMU 26

DWG DATE: 05/21/96 DWG NAME: 94SSS26



7.0 PRELIMINARY RISK EVALUATION

In accordance with *Guidance on Preliminary Risk Evaluations for the Purpose of Reaching a Finding of Suitability to Lease* (USEPA Region IV Memorandum, November 1994), a PRE was conducted for SWMU 26 to finalize its RCRA closure. One surface soil sample was collected from an unpaved area immediately adjacent to the south side of the neutralization unit (refer to Figure 4-1). The sample was shipped to an offsite laboratory (NET of Bedford, Massachusetts) under chain-of-custody documentation for the following analyses:

<i>Analysis</i>	<i>Method</i>
Semivolatile Organic Compounds	USEPA Method 8270
Chlorinated Pesticides/Polychlorinated Biphenyls	USEPA Method 8080
40 CFR 264 Appendix IX Metals	USEPA Method 6010/7000 Series

A PRE is conducted by constructing a table for carcinogenic and systemic (noncarcinogenic) compounds. The maximum concentration for each detected chemical and its corresponding RBC concentration are entered into the table to calculate cumulative human health risk. Soil data used in the calculations are exclusively from samples collected across the surface soil interval (0 to 1 foot bls).

Proportionate risk is calculated for each detected site chemical by comparing its maximum reported concentration with the corresponding RBC value. Risk and hazard for residential and commercial scenarios were calculated separately. RBC values were calculated by USEPA based on a risk threshold of 10^{-6} for carcinogens or a hazard quotient threshold of 1.0 for noncarcinogens. Therefore, a risk ratio is calculated for each contaminant by one of the following two equations:

Carcinogenic Risk Ratio: $RR = \frac{\text{media concentration}}{\text{screening value}} \times TR$

Noncarcinogenic Risk Ratio: $RR = \frac{\text{media concentration}}{\text{screening value}} \times THQ$

where:

RR	=	the risk ratio
Media Concentration	=	the maximum concentration of a site chemical
Screening Value	=	the RBC value for that particular chemical
TR	=	target risk used by USEPA to calculate RBCs for carcinogens (10^{-6})
THQ	=	target hazard quotient used by USEPA to calculate RBCs for noncarcinogens (1.0)

Tables 7-1 and 7-2 summarize PRE results for SWMU 26 for carcinogens and noncarcinogens, respectively. The risk ratios for each chemical are summed separately for both residential and commercial scenarios to determine the overall site risk. Cumulative risk (for carcinogens) and cumulative hazard index (HI) (for noncarcinogens) are calculated separately, and the cumulative risk and HI are each compared to the corresponding cumulative threshold in accordance with the November 1994 USEPA Region IV Memorandum.

If the carcinogenic Incremental Lifetime Excess Cancer Risk (ILCR) is greater than 10^{-4} (the cumulative risk threshold) or the noncarcinogenic HI is greater than 1 (the cumulative HI threshold), the site may require additional investigation for the corresponding land use scenario (USEPA Region IV Memorandum, November 1994). If neither threshold is exceeded, the property is considered suitable to lease for the specified land use scenario.

Table 7-1
Preliminary Risk Evaluation for SWMU 26
Residential and Commercial Carcinogens
NSA Memphis CSI

Parameter	Reference Concentration (mg/kg)	Maximum (mg/kg)	Residential RBC Carcinogen (mg/kg)	Risk Ratio	Commercial RBC Carcinogen (mg/kg)	Risk Ratio
* Arsenic	13.1	5.7	0.43		3.8	
Barium	19.1	82.8				
Benzo(a)anthracene		0.11	0.88	1.3E-07	7.8	1.4E-08
Benzo(a)pyrene		0.099	0.088	1.1E-06	0.78	1.3E-07
Benzo(b)fluoranthene		0.11	0.88	1.3E-07	7.8	1.4E-08
Benzo(g,h,i)perylene		0.051				
Benzo(k)fluoranthene		0.089	8.8	1.0E-08	78	1.1E-09
* Beryllium	0.96	0.53	0.15		1.3	
Bis(2-Ethylhexyl)phthalate		0.061	46	1.3E-09	410	1.5E-10
Chromium	26.4	15.2				
Chrysene		0.11	88	1.3E-09	780	1.4E-10
Cobalt	15	8.5				
Fluoranthene		0.22				
Indeno(1,2,3-cd)pyrene		0.048	0.88	5.5E-08	7.8	6.2E-09
Lead	28.7	19.5				
Nickel	ND	21.8				
Phenanthrene		0.12				
Pyrene		0.19				
Silver	ND	1.6				
Vanadium	49.6	25				
Zinc	88.3	65.1				
		ILCR	SUM	1E-06	SUM	2E-07

NOTES:

- ILCR Incremental lifetime excess cancer risk
- HI Hazard index
- Blank spaces Indicates not applicable
- ND Not detected
 - All concentrations are in parts per million (mg/kg).
 - The maximum concentration reported for each contaminant was used to develop the table above.
 - Soil sample data were from the surface (0-1") interval only.
 - Screening values (RBCs) are from the July to December 1995 Risk-Based Concentration (RBC) Table (October 20, 1995 USEPA Region III RBC memo).
 - The maximum lead (Pb) concentration reported at SWMU 26 was 19.5 mg/kg. This is less than the 400 mg/kg residential soil screening level for total lead (USEPA OSWER Directive 9355.4-12).
 - The RBC for pyrene was used as a surrogate for phenanthrene and benzo(g,h,i)perylene, which do not have RBCs.
- * This metal was excluded from the risk ratio because the maximum reported concentration is less than the corresponding reference concentration.

Table 7-2
Preliminary Risk Evaluation for SWMU 26
Residential and Commercial Noncarcinogens
NSA Memphis CSI

Parameter	Reference Concentration (mg/kg)	Maximum (mg/kg)	Residential RBC Noncarcinogen (mg/kg)	Hazard Ratio	Commercial RBC Noncarcinogen (mg/kg)	Hazard Ratio
* Arsenic	13.1	5.7				
Barium	19.1	82.8	5500	0.015	140000	0.00059
Benzo(a)anthracene		0.11				
Benzo(a)pyrene		0.099				
Benzo(b)fluoranthene		0.11				
Benzo(g,h,i)perylene		0.051	2300	2.22E-05	61000	8.36E-07
Benzo(k)fluoranthene		0.089				
Beryllium	0.96	0.53				
Bis(2-Ethylhexyl)phthalate		0.061				
* Chromium	26.4	15.2	390		10000	
Chrysene		0.11				
* Cobalt	15	8.5	4700		120000	
Fluoranthene		0.22	3100	7.10E-05	82000	2.68E-06
Indeno(1,2,3-cd)pyrene		0.048				
* Lead	28.7	19.5				
Nickel	ND	21.8	1600	0.014	41000	0.00053
Phenanthrene		0.12	2300	5.22E-05	61000	1.97E-06
Pyrene		0.19	2300	8.26E-05	61000	3.11E-06
Silver	ND	1.6	390	0.0041	10000	0.0002
* Vanadium	49.6	25	550		14000	
* Zinc	88.3	65.1	23000		610000	
		HI	SUM	0.033	SUM	0.0013

NOTES:

- ILCR Incremental excess lifetime cancer risk
- HI Hazard index
- Blank spaces Indicates not applicable
- ND Not detected
- All concentrations are in parts per million (mg/kg).
- The maximum concentration reported for each contaminant was used to develop the table above.
- Soil sample data were from the surface (0-1') interval only.
- Screening values (RBCs) are from the July to December 1995 Risk-Based Concentration (RBC) Table (October 20, 1995 USEPA Region III RBC memo).
- The maximum lead (Pb) concentration reported at SWMU 26 was 19.5 mg/kg. This is less than the 400 mg/kg residential soil screening level for total lead (USEPA OSWER Directive 9355.4-12).
- The RBC for pyrene was used as a surrogate for phenanthrene and benzo(g,h,i)perylene, which do not have RBCs.
- * Compound was excluded from the risk ratio because the maximum reported concentration is less than the corresponding reference concentration.

Benzo(a)pyrene was the only organic compound that exceeded its residential RBC. No constituent exceeded both the applicable USEPA RBCs and the established background RC for surface soil samples at NSA Memphis.

This PRE does not evaluate the potential exposure that might be experienced by a construction worker should the acid neutralization unit be removed in the future. This would require an acute or subchronic assessment of subsurface soil data. USEPA uses an exposure duration of 25 years — a chronic exposure scenario. Exposure durations less than seven years, as would be assumed for a construction worker scenario, are considered acute or subchronic. USEPA used chronic-based toxicological information when calculating RBCs, or USEPA makes conservative adjustments to reflect chronic exposure. In addition to the effect the exposure duration differences would have on a construction worker's cumulative risk and hazard estimates, toxicological information used by USEPA to calculate RBCs would be adjusted to reflect acute or subchronic toxicological endpoints rather than the chronic endpoints typically used. Acute and subchronic thresholds are based on lower exposure durations than chronic thresholds, and higher concentrations are generally necessary to elicit observable toxic effects. Higher thresholds for toxic effects result in less conservative toxicological information, which would be used to adjust RBCs for either acute or subchronic exposure. Because a construction worker would be exposed under either acute or subchronic conditions, and RBCs based on chronic exposure are generally more conservative, the commercial site worker scenario presented in this PRE would be a more conservative scenario than that for a construction worker.

The Preferred Reuse Alternative in the *Base Reuse and Development Plan* (RKG Associates Inc., 1995), indicates the most likely reuse of the parcel of land containing SWMU 26 will be for light industrial operations. Due to the nature of this proposed use, a commercial setting can be assumed to evaluate risk. With respect to the commercial scenario, the resulting ILCR and HI were well below the established criteria of 10^{-4} and 1, respectively. In addition, the resulting

ILCR and HI for the residential scenario were below the established 10^{-4} ILCR threshold and the HI threshold of 1.

Conclusions and Recommendations

Based on the information gathered during this investigation, the following conclusions and recommendations have been reached:

- SWMU 26 will likely be used for light industrial operations.
- Twenty-one semivolatile organic compounds and inorganics were detected in the soil sample collected from the surface interval.
- Maximum reported concentrations of arsenic and beryllium exceeded residential soil RBCs, and the reported concentration for arsenic exceeded the corresponding commercial RBC. However, the detected concentrations of arsenic and beryllium do not exceed the background RCs as shown on Tables 7-1 and 7-2.
- Based on a PRE performed on data from the sample collected from the 0 to 1-foot bls interval:
 - Carcinogens — Both the *commercial* and *residential* ILCRs did not exceed the 10^{-4} threshold, indicating suitability for lease with no further action for both commercial and residential land use.
 - Noncarcinogens — Both the *commercial* and *residential* HIs did not exceed 1, indicating suitability for lease with no further action for both commercial and residential land use.

8.0 CONCLUSIONS AND RECOMMENDATIONS

One surface soil sample collected next to the neutralization unit was analyzed for SVOCs, pesticide/PCBs, and Appendix IX metals, and the results were used to prepare a PRE. Subsurface soil samples were collected from three intervals at three locations surrounding the N-102 Battery Acid Neutralization Unit and from one location next to the sanitary sewer line which runs along the south side of Funafuti Street. The samples were analyzed for the following metals: arsenic, cadmium, lead, nickel, mercury, and zinc. Based on the results of this investigation, the following conclusions have been reached:

- Low concentrations of SVOCs were detected in the surface soil sample collected immediately south of the neutralization unit, likely originating from storm water runoff from the adjacent asphalt parking lot. Only one SVOC, benzo(a)pyrene, exceeded its residential RBC; however, it did not exceed its industrial RBC or its applicable SSL. Two inorganics in the surface soil sample exceeded RBCs. Arsenic exceeded the industrial RBC, and beryllium exceeded the residential RBC. However, arsenic and beryllium are naturally occurring compounds at NSA Memphis, and neither detected concentration exceeded its respective RC or SSL. The only inorganic which exceeded both the RC and the SSL was nickel in the surface soil sample; however, the detected concentration did not exceed the residential RBC. It should be noted that nickel's RC for subsurface soil is 59.8 mg/kg.
- Detected concentrations of inorganics in each subsurface soil sample did not exceed their RCs (2 times the mean background concentration) or USEPA SSLs.
- The PRE concluded that the property is suitable for lease for either residential or commercial land use.

Based on the results of the Geoprobe investigation and the PRE at SWMU 26, no further action is recommended for this site.

Confirmatory Sampling Investigation Report
Assembly C — SWMU 26, N-102 Battery Acid Neutralization Unit
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996

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9.0 REFERENCES

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- Kingsbury, James A. and John K. Carmichael (1995). *Hydrogeology of Post-Wilcox Group Stratigraphic Units in the Area of the Naval Air Station Memphis, Near Millington, Tennessee*. U.S. Geological Survey Water-Resources Investigations Report 95-4011, one sheet.

RKG and Associates (1995). *Memphis Naval Air Station Base Reuse and Economic Development Plan*. RKG Associates: Durham, New Hampshire.

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Appendix A

Analytical Results — N-102 Battery Acid Neutralization Unit Contents



ENVIRONMENTAL TESTING & CONSULTING INC.

2924 WALNUT GROVE RD • MEMPHIS, TN 38111 • PHONE (901) 327-2750 FAX (901) 327-6334

July 14, 1992

Ms. Jan Campbell
 Del-Jen, Inc. (NAS)
 P.O. Box 84188
 Millington, TN 38054

REF: ANALYTICAL TESTING
 SAMPLE DATE: 6/29/92
 SITE ID: NAS
 SAMPLE ID: NORTH 102 BATTERY ACID (LIQUID-SOLID)

SWMH #26

Dear Ms. Campbell:

The above referenced sample has been analyzed per your instructions. The tests were performed in our laboratory (#02027) in accordance with the Solid Waste Manual, SW-846. The sample was leached/filtered according to Method 1311, Toxicity Characteristic Leaching Procedure. The results are shown on the attached Analysis Data Sheets.

Please call our office if you have any questions.

Sincerely,

Randall H. Thomas
 Vice President

jw

Attachment

0629-034

Post-It™ brand fax transmittal memo 7671		# of pages »
To	James Worthy	From
Co.	South Olin	Co.
Dept.	Envir.	Phone #
Fax #	DSN 563-0465	DSN 966-5461
		Fax # (901) 873-5300

ENVIRONMENTAL TESTING AND CONSULTING, INC.
MEMPHIS, TN
TCLP METALS

Client Name : Del-Jen, Inc.
Site ID : NAS

Sample ID : NORTH 102 BATTERY ACID
Sample Date : 6/29/92
Date Arrived : 6/29/92

File Name : _0629-034_
Sample ID : _0629-034-1

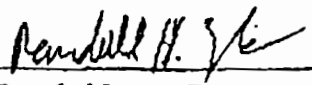
Date of TCLP Extraction : 7/01/92, Leachate/Filtrate Combined
Matrix Classification : Miscellaneous/Liquid-Solid

Metals	Results (ppm)	MS REC ¹	Results Fac(ppm) ²	Regulatory Level (ppm)	Method (SW-846)	Date Analyzed	By
Arsenic	0.061	104 NF	0.061	5.0	7061	7/08/92	JF
Barium	0.30	112 NF	0.30	100.0	7080	7/02/92	BB
Cadmium	0.066	102 NF	0.066	1.0	7130	7/02/92	BB
Chromium	<0.02	97	0.02	5.0	7190	7/01/92	BB
Lead	2.66	95	2.80	5.0	7420	7/09/92	BB
Mercury	0.0015	100 NF	0.0015	0.2	7470	7/01/92	JF
Silver	<0.01	100 NF	0.01	5.0	7760	7/02/92	BB
Selenium	0.006	91	0.007	1.0	7741	7/08/92	JF
VOCs	See Attached						
BNAS	See Attached						

Detection Limits (ppm)

Arsenic	0.002
Barium	0.03
Cadmium	0.002
Chromium	0.02
Lead	0.05
Mercury	0.001
Silver	0.01
Selenium	0.002

- 1 - Matrix Spike (%) Percent Recovery for Matrix Classification
2 - Sample results factored for Matrix Recovery Bias per Federal Regist
June 29, 1990.
NF - No Factor applied.


Randall H. Thomas
Vice President

ENVIRONMENTAL TESTING AND CONSULTING, INC.
MEMPHIS, TN
ORGANIC ANALYSIS DATA SHEET
TCLP BASE NEUTRAL AND ACID EXTRACTABLES

CLIENT NAME : DEL-JEN, INC. PROJECT # :
SITE ID : NAS ANALYST : RR
SAMPLE ID : NORTH 102 BATTERY ACID
SAMPLE DATE : 06/29/92
DATE ARRIVED : 06/29/92 FILE NAME : 0629-034.DOC
MATRIX : TCLP LEACHATE/FILTRATE SAMPLE # : 0629-034

DATE OF TCLP EXTRACTION : 07/01/92
MATRIX CLASSIFICATION : MISC LIQUID/SOLID

DATE EXTRACTED : 07/08/92 METHOD (SW-846): 8270
DATE ANALYZED : 07/16-17/92

COMPOUND	SAMPLE RESULTS (ppm)	MS REC ² (%)	SAMPLE RESULTS FAC(ppm) ³	DL ¹ (ppm)	REGULATOR LEVEL (ppm)
2,4-Dinitrotoluene	BDL	NF	BDL	0.05	0.13
Hexachlorobenzene	BDL	NF	BDL	0.05	0.13
Hexachlorobutadiene	BDL	NF	BDL	0.05	0.50
Hexachloroethane	BDL	NF	BDL	0.05	3.00
2-Methylphenol(o-cresol)	BDL	NF	BDL	0.05	200
3-Methylphenol(m-cresol)	BDL	NF	BDL	0.05	200
4-Methylphenol(p-cresol)	BDL	NF	BDL	0.05	200
Nitrobenzene	BDL	NF	BDL	0.05	2.00
Pentachlorophenol	0.05	88	0.06	0.05	100
2,4,5-Trichlorophenol	BDL	NF	BDL	0.05	400
2,4,6-Trichlorophenol	BDL	NF	BDL	0.05	2.00
Pyridine	BDL	NF	BDL	0.05	5.00

SURROGATE STANDARDS	RESULT	EXP(ng/ul)	%REC	QC LIMITS
Nitrobenzene-d5	111	100	111	35-114
2-Fluorobiphenyl	112	100	112	43-116
4-Terphenyl-d14	104	100	104	33-141
Phenol-D6	171	200	86	10-94
2,4,6-Tribromophenol	199	200	100	10-123
2-Fluorophenol	196	200	98	21-100

- 1 - DETECTION LIMIT
2 - MATRIX SPIKE RECOVERY FOR MATRIX CLASSIFICATION
3 - SAMPLE RESULTS FACTORED FOR MATRIX RECOVERY BIAS PER FEDERAL REGISTER
JUNE 29, 1990.
BDL - BELOW DETECTION LIMIT
NF - NO FACTOR APPLIED.

Robert H. Lusk
LABORATORY MANAGER

ENVIRONMENTAL TESTING AND CONSULTING, INC.
 MEMPHIS, TN
 ORGANIC ANALYSIS DATA SHEET
 TCLP VOLATILE COMPOUNDS

CLIENT NAME : DEL-JEN, INC. PROJECT # :
 SITE ID : NAS ANALYST : LS
 SAMPLE ID : NORTH 102 BATTERY ACID
 SAMPLE DATE : 06/29/92
 DATE ARRIVED : 06/29/92 FILE NAME : 0629-034.DOC
 MATRIX : TCLP LEACHATE/FILTRATE SAMPLE # : 0629-034

DATE OF TCLP EXTRACTION : 07/01/92
 MATRIX CLASSIFICATION : MISC LIQUID/SOLID

DATE ANALYZED : 07/14/92
 METHOD (SW-846): 8240

COMPOUND	SAMPLE RESULTS (ppm)	MS REC ² (%)	SAMPLE RESULTS FAC(ppm) ³	DL ¹ (ppm)	REGULATOR LEVEL (ppm)
Benzene	BDL	NF	BDL	0.005	0.50
Carbon Tetrachloride	BDL	NF	BDL	0.005	0.50
Chlorobenzene	BDL	NF	BDL	0.005	100
Chloroform	BDL	NF	BDL	0.050	6.00
1,4-Dichlorobenzene	BDL	NF	BDL	0.005	7.50
1,2-Dichloroethane	BDL	NF	BDL	0.005	0.50
1,1-Dichloroethene	BDL	NF	BDL	0.005	0.70
Methyl Ethyl Ketone	BDL	NF	BDL	0.050	200
Tetrachloroethene	BDL	NF	BDL	0.005	0.70
Trichloroethene	BDL	NF	BDL	0.005	0.50
Vinyl Chloride	BDL	NF	BDL	0.005	0.20

SURROGATE STANDARDS	RESULT	EXP(ug/L)	%REC	QC LIMITS
1,2-Dichloroethane-d4	39.9	50.0	80	76-114
Toluene-d8	45.3	50.0	91	88-110
4-Bromofluorobenzene	46.6	50.0	93	86-115

- 1 - DETECTION LIMIT
 2 - MATRIX SPIKE RECOVERY FOR MATRIX CLASSIFICATION.
 3 - SAMPLE RESULTS FACTORED FOR MATRIX RECOVERY BIAS PER FEDERAL REGISTER JUNE 29, 1990.
 BDL - BELOW DETECTION LIMIT
 NF - NO FACTOR APPLIED.

Michael J. Gaudin
 LABORATORY MANAGER

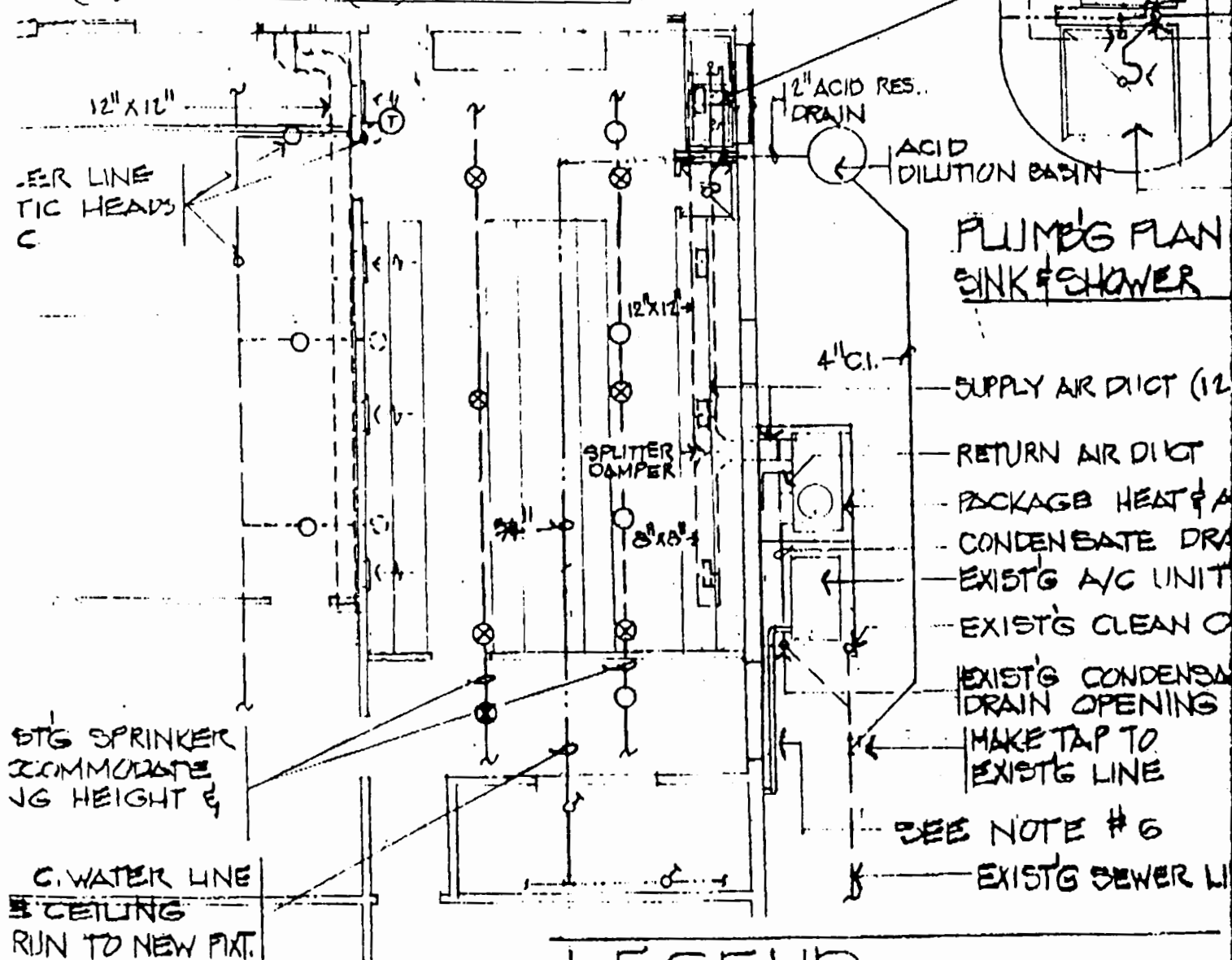
Post-It® brand fax transmittal memo 7671

of pages 4

To: James Worthy	From: Lt. Gruzewsky
Co: Southern Division	Co: NAS-Memphis
Dept:	Phone: (DSN) 966-5461
Fax: (DSN) 563-0965	Fax: (DSN) 966-5300

To	Mick Taylor	From	Danny Chumney
Co	South Div	Co	NAS- Memphis
		Phone #	(DSN) 966-5461
Fax #	(DSN) 563-0563	Fax #	(DSN) 966-5300

EMER. SHOWER
HEAD & EYE
WASH.



LEGEND

- ⊗ RELOCATED EXPOSED SPRINKLER HEAD.
- ⊗ NEW EXPOSED SPRINKLER HEAD.
- RELOCATED SPRINKLER HEAD IN ATTIC
- [] → SUPPLY AIR REG. 12" x 6" IN CEILING
- [] ← EXHAUST AIR REG 12" x 6" IN WALL. (4)

MECHANICAL PLAN

$$C_{\text{eff}} = 1/\epsilon'' = 1' - \epsilon''$$

ALL DUCTWORK SHALL BE GALVANIZED STEEL.

GAS TIGHT CAST IRON COVER
GROUT IN PLACE - 3' DIA. OPEN'G

Appendix B

Analytical Results for Surface and Subsurface Soil Samples

FORMAT: XXXX \ 1 2 3 4 5 6 7 8 9 0

XXXX \ - OPTIONAL project prefix
1 2 3 - SITE where sample collected
4 - MATRIX / QC code
5 6 7 8 - SAMPLING LOCATION
9 0 - DEPTH, INTERVAL, SERIAL #

All spaces MUST be filled and no extra characters included.
Use zeroes as space-fillers. Indicate MS/MSDs on COCs.

MATRIX/QC CODES:

S - soil (surface, borings, and trenches)
C - soil duplicate sample
M - sediment (settled, fluid-borne solid)
N - sediment duplicate
G - groundwater
H - groundwater duplicate sample
W - surface water
R - surface water duplicate sample
U - sludge
Y - sludge duplicate
A - air
Z - liquid waste (including IDW drums)
V - solid waste (including IDW drums)

T - trip blank
E - equipment rinsate blank
D - DI system blank
P - potable water blank
F - field blank
L - filter blank
B - EPA blind spike sample
2 - cement blank
3 - drilling mud
4 - grout blank
5 - bentonite blank
6 - sand blank

DATALCP3
05/17/96

NSA MEMPHIS
NSA MEMPHIS, RFI, ASSEMBLY C
SWMU 26 - SURFACE SOIL SAMPLES

Page: 1
Time: 13:02

APX9-METAL		SAMPLE ID -----> ORIGINAL ID -----> LAB SAMPLE ID ----> ID FROM REPORT --> SAMPLE DATE -----> MATRIX -----> UNITS ----->	026-S-0005-01 026SSB0501 143764S 026SSB0501 03/06/96 Soil MG/KG					
CAS #	Parameter	1719	VAL					
SB	Antimony	7.3	UR					
AS	Arsenic	5.7						
BA	Barium	82.8						
BE	Beryllium	0.53	J					
CD	Cadmium	1.2	UJ					
CR	Chromium	15.2	J					
CO	Cobalt	8.5	J					
CU	Copper	15.6	U					
PB	Lead	19.5						
HG	Mercury	0.12	U					
NI	Nickel	21.8						
SE	Selenium	0.34	U					
AG	Silver	1.6	J					
TL	Thallium	0.49	U					
V	Vanadium	25.						
ZN	Zinc	65.1						
SN	Tin	28.3	U					

*** Validation Complete ***

DATALCP3
05/17/96

NSA MEMPHIS
NSA MEMPHIS, RFI, ASSEMBLY C
SWMU 26 - SURFACE SOIL SAMPLES

Page: 2
Time: 13:02

SW846-PEST		SAMPLE ID -----> 026-S-0005-01					
		ORIGINAL ID -----> 026SS80501					
		LAB SAMPLE ID ----> 143764					
		ID FROM REPORT --> 026SS80501					
		SAMPLE DATE -----> 03/06/96					
		DATE EXTRACTED --> 03/11/96					
		DATE ANALYZED ----> 03/15/96					
		MATRIX -----> Soil					
		UNITS -----> ug/Kg					
CAS #	Parameter	1719	VAL				
319-84-6	alpha-BHC	2.	U				
319-85-7	beta-BHC	2.	U				
319-86-8	delta-BHC	2.	U				
58-89-9	gamma-BHC (Lindane)	2.	U				
76-44-8	Heptachlor	2.	U				
309-00-2	Aldrin	2.	U				
1024-57-3	Heptachlor epoxide	2.	U				
959-98-8	Endosulfan I	2.	U				
60-57-1	Dieldrin	4.1	U				
72-55-9	4,4'-DDE	4.1	UJ				
72-20-8	Endrin	4.1	U				
33213-65-9	Endosulfan II	4.1	U				
72-54-8	4,4'-DDD	4.1	U				
1031-07-8	Endosulfan sulfate	4.1	U				
50-29-3	4,4'-DDT	4.1	U				
72-43-5	Methoxychlor	20.	U				
53494-70-5	Endrin ketone	4.1	U				
7421-93-4	Endrin aldehyde	4.1	U				
5103-71-9	alpha-Chlordane	2.	U				
5103-74-2	gamma-Chlordane	2.	U				
8001-35-2	Toxaphene	41.	U				
12789-03-6	Technical Chlordane	41.	U				
12674-11-2	Aroclor-1016	41.	U				
11104-28-2	Aroclor-1221	41.	U				
11141-16-5	Aroclor-1232	41.	U				
53469-21-9	Aroclor-1242	41.	U				
12672-29-6	Aroclor-1248	41.	U				
11097-69-1	Aroclor-1254	41.	U				
11096-82-5	Aroclor-1260	41.	UJ				

*** Validation Complete ***

DATALCP3
05/17/96

NSA MEMPHIS
NSA MEMPHIS, RFI, ASSEMBLY C
SWMU 26 - SURFACE SOIL SAMPLES

Page: 3
Time: 13:02

SW846-SVOA		SAMPLE ID ----->	026-S-0005-01					
		ORIGINAL ID ----->	026SSB0501					
		LAB SAMPLE ID ---->	143764					
		ID FROM REPORT -->	026ssb0501					
		SAMPLE DATE ----->	03/06/96					
		DATE EXTRACTED -->	03/11/96					
		DATE ANALYZED ---->	03/12/96					
		MATRIX ----->	Soil					
		UNITS ----->	ug/Kg					
CAS #	Parameter	1719	VAL					
108-95-2	Phenol	430.	U					
111-44-4	bis(2-Chloroethyl)ether	430.	U					
95-57-8	2-Chlorophenol	430.	U					
541-73-1	1,3-Dichlorobenzene	430.	U					
106-46-7	1,4-Dichlorobenzene	430.	U					
95-50-1	1,2-Dichlorobenzene	430.	U					
95-48-7	2-Methylphenol (o-Cresol)	430.	U					
108-60-1	2,2'-oxybis(1-Chloropropane)	430.	U					
106-44-5	4-Methylphenol (p-Cresol)	430.	U					
621-64-7	N-Nitroso-di-n-propylamine	430.	U					
67-72-1	Hexachloroethane	430.	U					
98-95-3	Nitrobenzene	430.	U					
78-59-1	Isophorone	430.	U					
88-75-5	2-Nitrophenol	430.	U					
105-67-9	2,4-Dimethylphenol	430.	U					
120-83-2	2,4-Dichlorophenol	430.	U					
120-82-1	1,2,4-Trichlorobenzene	430.	U					
91-20-3	Naphthalene	430.	U					
106-47-8	4-Chloroaniline	430.	U					
111-91-1	bis(2-Chloroethoxy)methane	430.	U					
87-68-3	Hexachlorobutadiene	430.	U					
59-50-7	4-Chloro-3-methylphenol	430.	U					
91-57-6	2-Methylnaphthalene	430.	U					
77-47-4	Hexachlorocyclopentadiene	430.	U					
88-06-2	2,4,6-Trichlorophenol	430.	U					
95-95-4	2,4,5-Trichlorophenol	1100.	U					
91-58-7	2-Chloronaphthalene	430.	U					
88-74-4	2-Nitroaniline	1100.	U					
131-11-3	Dimethyl phthalate	430.	U					
208-96-8	Acenaphthylene	430.	U					
606-20-2	2,6-Dinitrotoluene	430.	U					
99-09-2	3-Nitroaniline	1100.	U					
83-32-9	Acenaphthene	430.	U					
51-28-5	2,4-Dinitrophenol	1100.	U					
100-02-7	4-Nitrophenol	1100.	U					
132-64-9	Dibenzofuran	430.	U					

*** Validation Complete ***

DATALCP3
05/17/96

NSA MEMPHIS
NSA MEMPHIS, RFI, ASSEMBLY C
SWMU 26 - SURFACE SOIL SAMPLES

Page: 4
Time: 13:02

SW846-SVOA		SAMPLE ID -----> 026-S-0005-01 ORIGINAL ID -----> 026SSB0501 LAB SAMPLE ID ----> 143764 ID FROM REPORT --> 026ssb0501 SAMPLE DATE -----> 03/06/96 DATE EXTRACTED --> 03/11/96 DATE ANALYZED ----> 03/12/96 MATRIX -----> Soil UNITS -----> ug/Kg					
CAS #	Parameter	1719	VAL				
121-14-2	2,4-Dinitrotoluene	430.	U				
84-66-2	Diethylphthalate	430.	U				
7005-72-3	4-Chlorophenylphenylether	430.	U				
86-73-7	Fluorene	430.	U				
100-01-6	4-Nitroaniline	1100.	U				
534-52-1	2-Methyl-4,6-Dinitrophenol	1100.	U				
86-30-6	N-Nitrosodiphenylamine	430.	U				
101-55-3	4-Bromophenyl-phenylether	430.	U				
118-74-1	Hexachlorobenzene	430.	U				
87-86-5	Pentachlorophenol	1100.	U				
85-01-8	Phenanthrene	120.	J				
120-12-7	Anthracene	430.	U				
86-74-8	Carbazole	430.	U				
84-74-2	Di-n-butylphthalate	430.	U				
206-44-0	Fluoranthene	220.	J				
129-00-0	Pyrene	190.	J				
85-68-7	Butylbenzylphthalate	430.	U				
91-94-1	3,3'-Dichlorobenzidine	430.	U				
56-55-3	Benzo(a)anthracene	110.	J				
218-01-9	Chrysene	110.	J				
117-81-7	bis(2-Ethylhexyl)phthalate (BEHP)	61.	J				
117-84-0	Di-n-octyl phthalate	430.	U				
205-99-2	Benzo(b)fluoranthene	110.	J				
207-08-9	Benzo(k)fluoranthene	89.	J				
50-32-8	Benzo(a)pyrene	99.	J				
193-39-5	Indeno(1,2,3-cd)pyrene	48.	J				
53-70-3	Dibenz(a,h)anthracene	430.	U				
191-24-2	Benzo(g,h,i)perylene	51.	J				

*** Validation Complete ***

DATALCP3
10/30/95

NAS MEMPHIS
NAS MEMPHIS, RFI, ASSEMBLY C
SWMU 26 - Primary Samples

Page: 1
Time: 11:24

METAL		SAMPLE ID ----->	026-S-0001-04	026-S-0001-08	026-S-0001-18	026-S-0002-04	026-S-0002-08	026-S-0002-18
		ORIGINAL ID ----->	026S000104	026S000108	026S000118	026S000204	026S000208	026S000218
		LAB SAMPLE ID ---->	4-124590S	4-124591S	4-124592S	4-124593S	4-124594S	4-124595S
		ID FROM REPORT -->	026S000104	026S000108	026S000118	026S000204	026S000208	026S000218
		SAMPLE DATE ----->	06/05/95	06/05/95	06/05/95	06/05/95	06/05/95	06/05/95
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil
		UNITS ----->	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG
CAS #	Parameter		1439 VAL	1439 VAL	1439 VAL	1439 VAL	1439 VAL	1439 VAL
AS	Arsenic		3.6 UJ	5.1 J	2. UJ	9. J	3.8 J	2.9 UJ
CD	Cadmium		0.75 UJ	0.76 UJ	0.73 UJ	0.79 UJ	1. J	0.72 UJ
PB	Lead		6.3	7.6	5.	7.8	6.1	5.8
HG	Mercury		0.13 U	0.12 U	0.12 U	0.13 U	0.12 U	0.12 U
NI	Nickel		11.8 J	15.9 J	13.5 J	18.8 J	16.8 J	14.5 J
ZN	Zinc		29.2	32.3	17.7	42.	31.6	15.1
SB	Antimony		NR	NR	NR	NR	NR	NR
BA	Barium		NR	NR	NR	NR	NR	NR
BE	Beryllium		NR	NR	NR	NR	NR	NR
CR	Chromium		NR	NR	NR	NR	NR	NR
CO	Cobalt		NR	NR	NR	NR	NR	NR
CU	Copper		NR	NR	NR	NR	NR	NR
SE	Selenium		NR	NR	NR	NR	NR	NR
AG	Silver		NR	NR	NR	NR	NR	NR
TL	Thallium		NR	NR	NR	NR	NR	NR
V	Vanadium		NR	NR	NR	NR	NR	NR
SN	Tin		NR	NR	NR	NR	NR	NR

*** Validation Complete ***

DATALCP3
10/30/95

NAS MEMPHIS
NAS MEMPHIS, RFI, ASSEMBLY C
SWMU 26 - Primary Samples

Page: 2
Time: 11:24

METAL		SAMPLE ID ----->	026-S-0003-04	026-S-0003-08	026-S-0003-18	026-S-0004-04	026-S-0004-08	026-S-0004-15					
		ORIGINAL ID ----->	026S000304	026S000308	026S000318	026S000404	026S000408	026S000415					
		LAB SAMPLE ID ---->	4-124596S	4-124597S	4-124598S	4-124599S	4-124600S	4-124601S					
		ID FROM REPORT -->	026S000304	026S000308	026S000318	026S000404	026S000408	026S000415					
		SAMPLE DATE ----->	06/05/95	06/05/95	06/05/95	06/05/95	06/05/95	06/05/95					
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil					
		UNITS ----->	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG					
CAS #	Parameter	1439	VAL	1439	VAL	1439	VAL	1439	VAL				
AS	Arsenic	6.6	J	0.49	UJ	1.1	UJ	3.9	J	7.3	J	1.7	UJ
CD	Cadmium	0.97	J	0.96	J	0.77	J	0.78	J	1.2	J	0.68	UJ
PB	Lead	5.9		7.4		7.1		0.49	U	5.2		6.5	
HG	Mercury	0.12	U	0.12	U	0.12	U	0.12	U	0.12	U	0.12	U
NI	Nickel	18.5	J	15.8	J	11.1	J	19.9	J	16.4	J	11.4	J
ZN	Zinc	34.7		29.		18.		30.1		23.8		21.	
SB	Antimony	NR		NR		NR		NR		NR		NR	
BA	Barium	NR		NR		NR		NR		NR		NR	
BE	Beryllium	NR		NR		NR		NR		NR		NR	
CR	Chromium	NR		NR		NR		NR		NR		NR	
CO	Cobalt	NR		NR		NR		NR		NR		NR	
CU	Copper	NR		NR		NR		NR		NR		NR	
SE	Selenium	NR		NR		NR		NR		NR		NR	
AG	Silver	NR		NR		NR		NR		NR		NR	
TL	Thallium	NR		NR		NR		NR		NR		NR	
V	Vanadium	NR		NR		NR		NR		NR		NR	
SN	Tin	NR		NR		NR		NR		NR		NR	

*** Validation Complete ***

**ASSEMBLY C CSI REPORT
NAVAL SUPPORT ACTIVITY MEMPHIS
MILLINGTON, TENNESSEE**

**RCRA FACILITY INVESTIGATION
SWMU 27 — NORTHSIDE SEWAGE TREATMENT
PLANT**

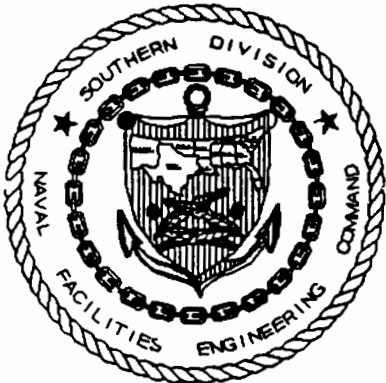
REVISION 2

**CTO-094
Contract No: N62467-89-D-0318**



Prepared for:

**Department of the Navy
Southern Division
Naval Facilities Engineering Command
North Charleston, South Carolina**



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September 25, 1996

Table of Contents

EXECUTIVE SUMMARY	iv
1.0 INTRODUCTION	1-1
2.0 SITE DESCRIPTION AND HISTORICAL INFORMATION	2-1
2.1 Site Description	2-1
2.2 Historical Site Operations	2-5
3.0 PREVIOUS INVESTIGATIONS	3-1
4.0 FIELD INVESTIGATIONS AND METHODOLOGY	4-1
4.1 Investigation of Soil and Groundwater	4-3
4.2 Sampling Rationale and Methods	4-3
4.3 Sample Processing and Chain-of-Custody Procedure	4-9
4.4 Grouting Procedure	4-10
4.5 Decontamination Procedures	4-10
5.0 GEOLOGY AND HYDROGEOLOGY	5-1
5.1 Regional Geology and Hydrogeology	5-1
5.2 Site-Specific Geology and Hydrogeology	5-2
6.0 NATURE AND EXTENT OF CONTAMINATION	6-1
6.1 Background Reference Concentrations	6-2
6.2 Soil Sample Analytical Results	6-2
6.2.1 Surface Soil Samples	6-2
6.2.2 Subsurface Soil Samples	6-19
6.3 Groundwater Results	6-23
6.4 Summary of Nature and Extent	6-23
7.0 PRELIMINARY RISK EVALUATION	7-1
8.0 CONCLUSIONS AND RECOMMENDATIONS	8-1
9.0 REFERENCES	9-1

List of Figures

Figure 1-1	Vicinity Map	1-3
Figure 1-2	Digital Orthophotograph	1-5
Figure 2-1	Site Map	2-3
Figure 4-1	Geoprobe and Hand-Auger Sample Locations	4-5

Figure 6-1	Background Sample Locations	6-3
Figure 6-2	Total VOCs in Surface Soil	6-11
Figure 6-3	Total Pesticides in Surface Soil	6-15
Figure 6-4	SVOCs in Surface Soil	6-17
Figure 6-5	Metals in Surface Soil	6-21
Figure 6-6	VOCs in Groundwater	6-25
Figure 6-7	Transfer from Soil to Groundwater SSL Exceedances	6-29

List of Tables

Table 6-1	Detected Concentrations of VOCs, Pesticides, SVOCs, and Metals in Surface Soil	6-5
Table 6-2	Detected Concentrations of VOCs and Metals in Subsurface Soil	6-7
Table 6-3	Detected Concentrations of VOCs in Groundwater	6-27
Table 7-1	PRE for Residential and Commercial Carcinogens	7-3
Table 7-2	PRE for Residential and Commercial Noncarcinogens	7-4

List of Appendices

Appendix A	Analytical Data
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LIST OF ACRONYMS AND ABBREVIATIONS

BRAC	Base Realignment and Closure
bls	below land surface
cm/sec	centimeters per second
CSI	Confirmatory Sampling Investigation
DQO	Data Quality Objectives
E/A&H	EnSafe/Allen & Hoshall
ft/day	feet per day
HI	Hazard Index
ILCR	Incremental Lifetime Excess Cancer Risk
MCL	maximum contaminant level
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
ND	not detected
NET	National Environmental Testing, Inc.
NSA	Naval Support Activity (formerly Naval Air Station)
PCBs	polychlorinated biphenyls
PRE	preliminary risk evaluation
QA/QC	Quality Assurance/Quality Control
RBC	risk-based concentration
RC	reference concentration
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SWMU	solid waste management unit
SSL	soil screening level
STP	sewage treatment plant
SVOC	semivolatile organic compound
THQ	target hazard quotient
TR	target risk
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound
VSI	visual site inspection

EXECUTIVE SUMMARY

The *Assembly C Site Investigation Plans* (E/A&H 1995) proposed two phases of investigation for a Confirmatory Sampling Investigation (CSI) at Solid Waste Management Unit (SWMU) 27, the Northside Sewage Treatment Plant at Naval Support Activity (NSA) Memphis. The first phase consisted of a hand-auger and Geoprobe investigation of the former sludge drying beds. Based on the results of the first phase, the second phase, consisting of advancing and sampling soil borings and monitoring wells, is not required. This report summarizes the activities conducted during the CSI's first phase and the resulting findings and conclusions.

During the Geoprobe investigation, nine surface soil and 18 subsurface soil samples collected from nine sampling locations were analyzed for volatile organic compounds (VOCs) and Appendix IX metals. To finalize the Resource Conservation and Recovery Act closure of the SWMU, a hand auger was used to collect additional surface soil at three of the sampling locations in the sludge drying beds; these samples were analyzed for semivolatile organic compounds (SVOCs) and pesticides/polychlorinated biphenyls. The surface soil sample results were used to prepare a Preliminary Risk Evaluation (PRE). Groundwater samples were collected from the upper fluvial deposits with a Geoprobe at six of the nine soil sampling locations. The groundwater samples were analyzed for VOCs only.

The only VOCs identified in surface and subsurface soil were low concentrations of isopropylbenzene/bromobenzene at Locations 3 and 6. No risk-based concentration (RBC) exists for either of these compounds, which could not be distinguished by the onsite laboratory instrumentation due to similar retention times.

Eight pesticides were detected in the three surface soil samples. The dieldrin concentration exceeded the industrial RBC and the soil screening level (SSL) in two samples and exceeded the residential RBC and the SSL in the third sample. However, dieldrin is ubiquitous to NSA Memphis due to its basewide aerial application during the 1950s and 1960s. Aldrin was detected above the SSL, but did not exceed its residential RBC.

Nineteen SVOCs were detected in the three surface soil samples. The concentration of benzo(a)pyrene exceeded the industrial RBC at one location, and exceeded the residential RBC at a second location. Benzo(a)anthracene exceeded both the residential RBC and the SSL at one location. Benzo(b)fluoranthene and dibenz(a,h)anthracene exceeded the residential RBC at one location, and chrysene exceeded the SSL at one location.

Sixteen metals were detected in the surface soil samples, most of which exceeded their background reference concentrations (RCs, or two times the mean background concentration) at NSA Memphis. Arsenic exceeded its RC, industrial RBC, and SSL at two locations. Beryllium was identified at concentrations above the residential RBC in most samples; however, the background RC of beryllium (0.96 milligrams per kilogram [mg/kg]) exceeds the residential RBC (0.15 mg/kg). No other metal exceeded its residential RBC. The SSL and the background RC were exceeded for barium at two sampling locations and for mercury at one location.

Sixteen metals were detected in the subsurface soil samples. Barium exceeded the SSL and the RC in one sample. Antimony and tin, which do not have SSLs, exceeded their RC in two subsurface soil samples each.

No VOCs were identified in groundwater by the onsite laboratory. Three groundwater samples were split and submitted to the offsite laboratory for confirmation analysis. The only VOCs identified in the split samples were acetone at two locations, toluene at one location, and carbon disulfide at one location. Acetone is a common laboratory artifact. No RBCs for tap water or maximum contaminant levels for drinking water were exceeded by VOCs detected in groundwater.

The PRE results indicate the property is suitable to lease for commercial land use. Based on the results of the first phase and the anticipated commercial land use of the property, no further action is recommended for SWMU 27.

1.0 INTRODUCTION

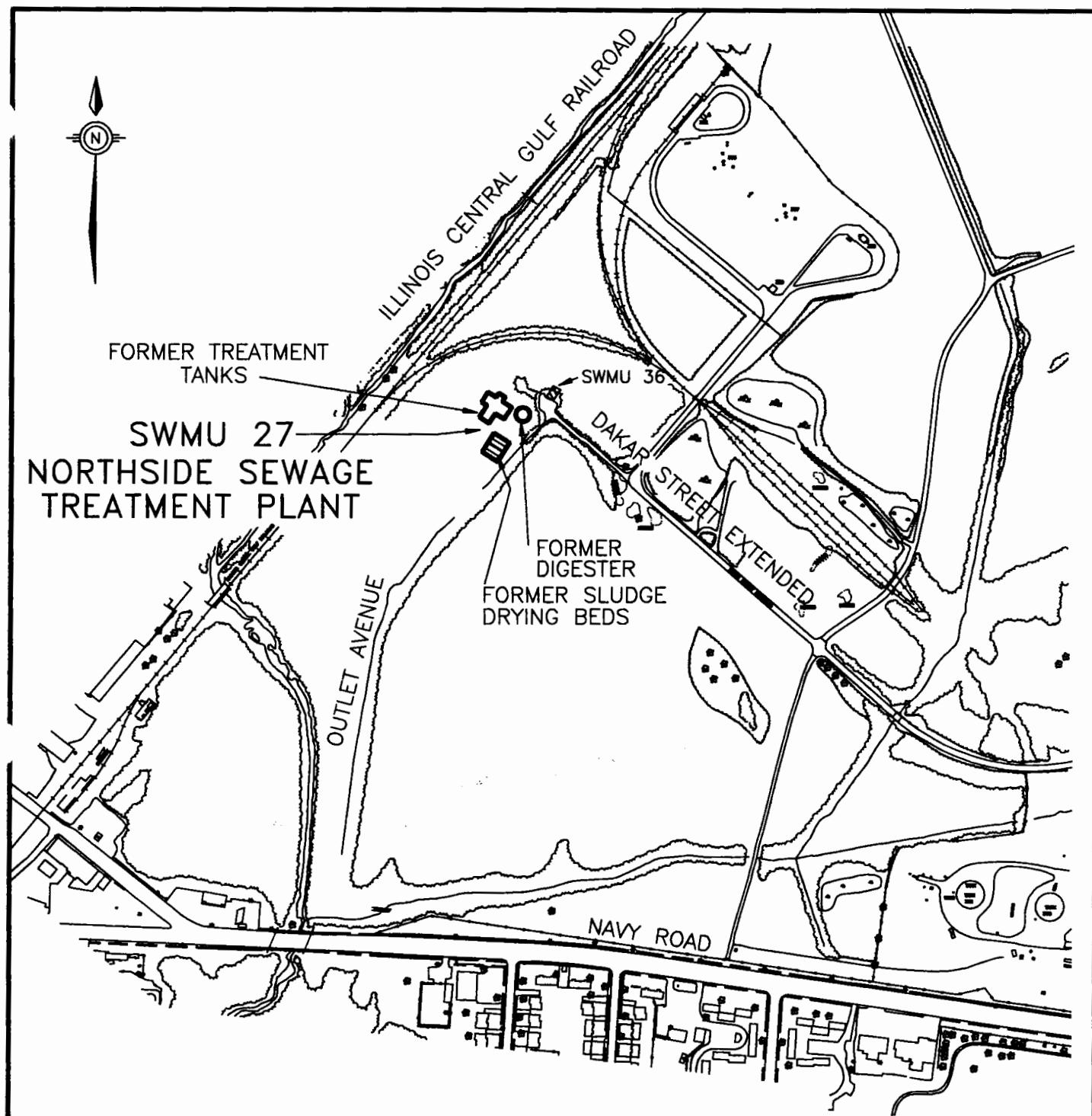
As part of the U.S. Navy Installation Restoration Program, the following Confirmatory Sampling Investigation (CSI) report has been prepared for Solid Waste Management Unit (SWMU) 27, the Northside Sewage Treatment Plant, at Naval Support Activity (NSA) Memphis, Millington, Tennessee. Figures 1-1 and 1-2 provide a location map and aerial photograph, respectively, of SWMU 27.

As a result of the Base Closure and Realignment Act of 1990 (BRAC), a portion of NSA Memphis, which includes SWMU 27, will be closed and prepared for transfer to the City of Millington. Eight SWMU assemblies (i.e., groups) have been defined for the NSA Memphis Resource Conservation and Recovery Act (RCRA) Corrective Action Program. Four of these assemblies (A, B, C, and D) are on closing portions of the base and have been categorized and ranked according to their BRAC status. SWMU 27 is in Assembly C, which is composed of five SWMUs requiring CSIs to determine whether a release of contaminants has occurred and, if so, whether RCRA Facility Investigation (RFI) characterization will be required. The remaining four assemblies (E, F, G, and H) are on portions of the base that will remain open. The investigation, undertaken by EnSafe/Allen & Hoshall (E/A&H), adhered to the requirements of the Hazardous and Solid Waste Amendments portion (HSWA-TN002) of RCRA Permit No. TN2-170-022-600 and applicable regulations.

The *Assembly C Site Investigation Plans* (E/A&H, 1995) proposed two phases of investigation for the CSI at SWMU 27. The first phase consisted of a soil and groundwater investigation using a hand auger and truck-mounted Geoprobe equipment. Based on the results of the first phase, the second phase, consisting of installing and sampling soil borings and monitoring wells, is not required. The surface soil sample results were used to prepare a Preliminary Risk Evaluation (PRE). The PRE indicates the property is suitable to lease for commercial land use. This CSI report summarizes the activities conducted during the first phase of the CSI and provides conclusions, including a recommendation for no further action.

*Confirmatory Sampling Investigation Report
Assembly C — SWMU 27, Northside Sewage Treatment Plant
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996*

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500 0 500
SCALE FEET



RCRA FACILITY
INVESTIGATION
NSA MEMPHIS
MILLINGTON, TN

FIGURE 1-1
VICINITY MAP
NORTHSIDE SEWAGE
TREATMENT PLANT
SWMU 27

DWG DATE: 10/23/95 DWG NAME: 94RVM27

Confirmatory Sampling Investigation Report
Assembly C — SWMU 27, Northside Sewage Treatment Plant
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996

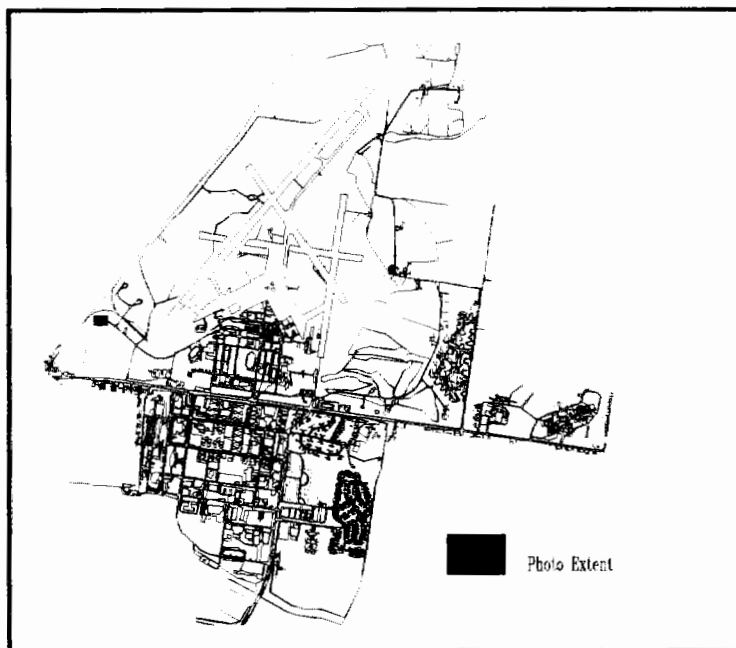
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SWMU 27 BOUNDARY



Photograph Scale



RCRA FACILITY INVESTIGATION NSA MEMPHIS MILLINGTON, TENNESSEE

FIGURE 1-2 DIGITAL ORTHOPHOTOGRAPH NORTHSIDE SEWAGE TREATMENT PLANT SWMU 27

AML: bormel/hort/mcswellie_dir

2.0 SITE DESCRIPTION AND HISTORICAL INFORMATION

2.1 Site Description

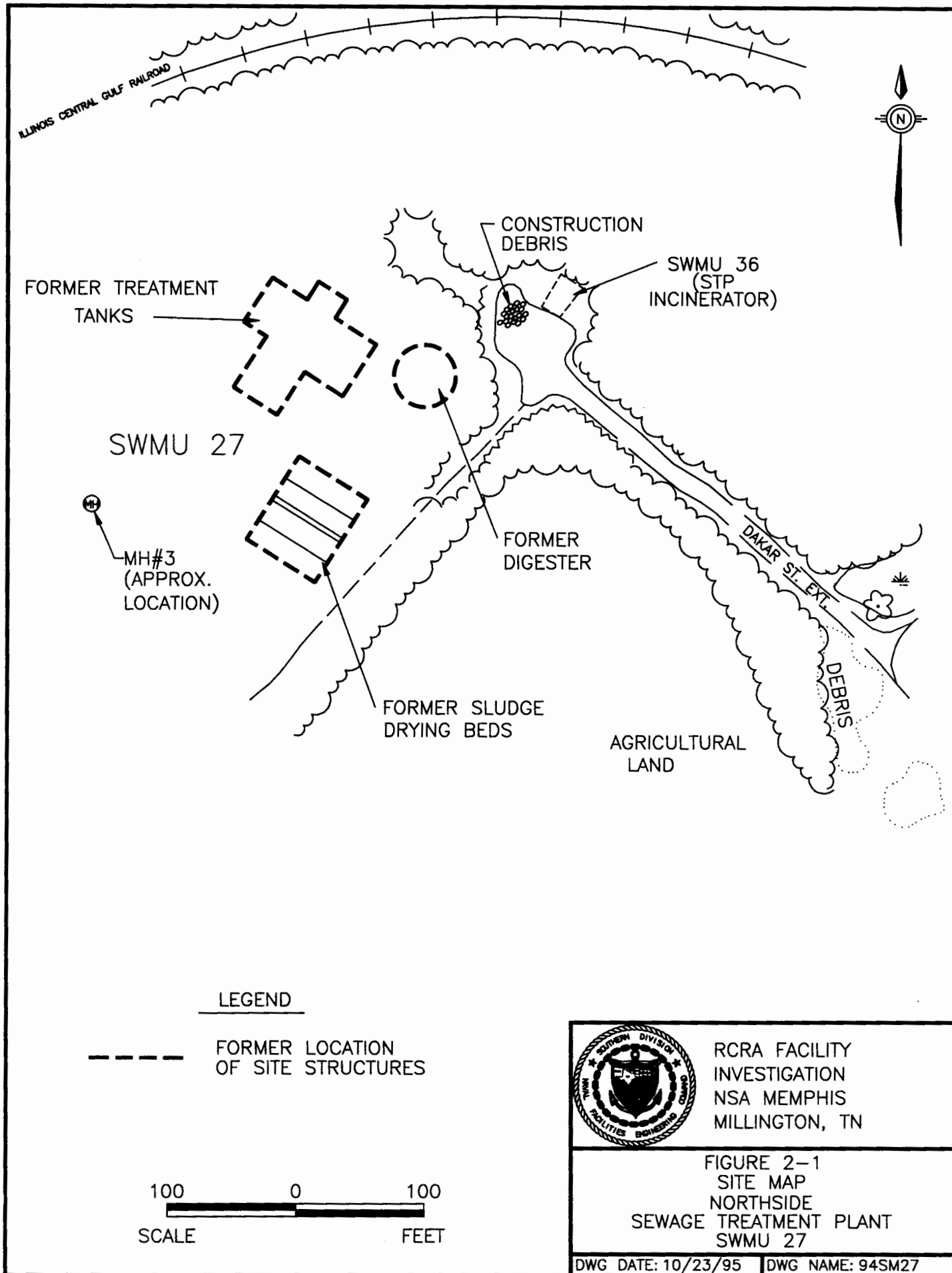
SWMU 27 is the site of a former sewage treatment plant (STP) at the southwest corner of the NSA Memphis Northside near Dakar Street Extended and Outlet Avenue. The STP was constructed in 1943 and included a digester tank (N-44), a control house, six treatment tanks (N-45) and four sludge drying beds (N-46). The STP is no longer in use, and site features have been demolished. There are conflicting dates as to when the STP was demolished — either in the mid-1970s or as late as 1984. There are also reports of the operations discontinuing between the late 1940s and early 1950s, suggesting less than 15 years of operation. Figure 2-1 shows the locations of the former site features.

The site exhibits extensive revegetation, both natural and anthropogenic, which, based on the maturity of the trees, is likely the result of about a 20-year period of regrowth. A visual site inspection (VSI) was conducted by E/A&H in January 1995, when most of the vegetation was dormant. Although a previous VSI conducted in April 1990 did not identify traces of the STP, sparse winter vegetation made a few remnants more visible.

A small piece of a reinforced concrete surface was observed beneath approximately 4 to 6 inches of soil and detritus in the area of the former digester, indicating some remnant foundations or structures may still exist beneath the topsoil. On the western side of the site, approximately 150 feet of a 3-foot wide, 6-inch thick concrete walkway was exposed in several areas. In one such area, the top of an open-ended, 12-inch-diameter iron pipe was visible crossing beneath the walk. The walk was oriented east-to-west near the north edge of N-45 and extended to the old Illinois Central Gulf Railroad tracks, oriented northeast-southwest along the western site boundary. Although still quite prominent, this feature was not identified on the STP construction plans, and its purpose is unknown.

Confirmatory Sampling Investigation Report
Assembly C — SWMU 27, Northside Sewage Treatment Plant
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996

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A large, octagonal concrete manhole/cap identified on the 1942 STP plans as "M.H. #3" is approximately 120 feet west of the former sludge drying beds. This manhole reportedly provides access to an 18-inch sewer discharge pipe and contains a 15-inch automatic flood gate. The rest of the site is overgrown, dominated by rows of planted pine trees with mixed deciduous trees and a thick understory. The dirt roadway east of the STP is still maintained to allow for occasional access. Beneath an inch of topsoil and high grass, the gravel drive to the north of the STP is also present. No other STP features were apparent during the 1995 VSI.

Several small sink holes are in the wooded areas, some of which contain standing water. The old Illinois Central Gulf Railroad track is approximately 450 feet west of the site. A drainage ditch parallels the western side of the railroad track (see Figure 1-1). Surface water at the site drains west-southwest, crosses under the railroad track through a culvert, and flows into the drainage ditch, which conveys the water approximately 700 feet southwest of the culvert where it enters North Fork Creek. North Fork Creek, in turn, conveys water southward for approximately 4,500 feet to the Big Creek Drainage Canal, which parallels the south boundary of NSA Memphis.

2.2 Historical Site Operations

While in operation, the STP reportedly received mostly sanitary waste from the Northside of the base. There was, however, a period during the 1940s and 1950s in which some industrial wastes (oils, solvents, and paints) were reportedly discharged to the sewage system from various operations. Water was removed from sewage sludge by pumping it onto the four 20-foot by 55-foot drying beds. The drying beds consisted of a three-layer filter substrate, made up of 8 inches of sand, 6 inches of pea gravel, and a 10- to 13-inch layer of coarse aggregate. Within the aggregate layer was a system of 6-inch drain lines to transport percolated water. Drying bed diagrams indicate that each bed was open to undisturbed earth below the aggregate substrate. This interface is most likely the release point for STP contaminants, and this is the only treatment process at the site during which waste was likely to directly contact native soil.

Confirmatory Sampling Investigation Report
Assembly C — SWMU 27, Northside Sewage Treatment Plant
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996

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3.0 PREVIOUS INVESTIGATIONS

Before the CSI, no investigations were performed at SWMU 27.

Confirmatory Sampling Investigation Report
Assembly C — SWMU 27, Northside Sewage Treatment Plant
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996

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4.0 FIELD INVESTIGATIONS AND METHODOLOGY

The CSI soil and groundwater sampling program was intended to determine if contaminants associated with past activities at SWMU 27 were present. Specifically, the CSI objectives were:

- Determine the potential for subsurface soil contamination in the loess as a result of sludge drying practices.
- Determine the potential for groundwater contamination in the surficial aquifer as a result of sludge drying practices.
- Determine the suitability of the property for leasing by preparing a PRE.

This section summarizes the soil and groundwater sampling tasks during the first phase of the CSI, which was conducted using a hand auger and Geoprobe sampling equipment. The field sampling activities followed the procedures outlined in the U.S. Environmental Protection Agency (USEPA)- and Tennessee Department of Environment and Conservation-approved *Comprehensive RFI Work Plan* (E/A&H, 1994) and *Assembly C Site Investigation Plans* (E/A&H, 1995).

A description of the sample locations and the rationale for sampled intervals are presented in Sections 4.1 and 4.2, respectively, of this CSI report. Section 4.3 presents the specific sampling protocols (sample processing, labeling, and chain-of-custody documentation).

Analytical Parameters

Nine surface soil samples, 18 subsurface soil samples, and six groundwater samples were collected during the CSI to determine the nature and extent of contamination by volatile organic compounds (VOCs), and metals associated with sludge drying practices at SWMU 27. In addition, three surface soil samples were also analyzed for chlorinated pesticides/polychlorinated

biphenyls (PCBs) and semivolatile organic compounds (SVOCs). Hydrologic, Incorporated's mobile onsite laboratory analyzed the soil and groundwater samples for VOCs using USEPA Method 8021. Twenty-five percent of the soil and groundwater samples submitted to Hydrologic for VOC analysis were split and submitted to the National Environmental Testing, Inc. (NET), laboratory in Bedford, Massachusetts, for confirmation analysis by USEPA Method 8240. NET analyzed the samples for pesticides/PCBs, SVOCs, and Appendix IX metals by the USEPA Methods 8080, 8270, and the 6010/7000 series, respectively.

Hydrologic used a Level II-equivalent Data Quality Objective (DQO) for onsite sample analysis. NET used a Level III-equivalent DQO for 95% of the samples and a Level IV-equivalent DQO for 5% of the samples.

E/A&H validated the analytical results of the three surface soil samples analyzed for pesticides/PCBs and SVOCs. Validata Chemical Services, Inc., of Norcross, Georgia, validated the analytical results of the remaining NET samples. Attachment 1 contains the validation report, which indicates that the overall data quality of the analytical work is satisfactory.

Hand-Auger Sampling Methods

E/A&H collected three surface soil samples for pesticide/PCB and SVOC analyses using a 3-inch diameter, stainless-steel hand auger. The hand auger was advanced from land surface to 1 foot below land surface (bls) using a clockwise motion. The soil collected in the auger was placed in a stainless-steel bowl for processing.

Geoprobe Sampling Methods

Tri-State Testing Services, Inc., (Tri-State), of Memphis, Tennessee, collected the soil and groundwater samples using a truck-mounted hydraulically driven, Geoprobe sampling system. Soil samples were obtained by advancing a 1-inch diameter soil probe to the desired sampling depth. The 48-inch sampler, situated at the end of the probe, contained a "push point" which

retracted when the sampling interval was reached. The sampler was then advanced through the sampling interval. The soil sample was then retrieved from the borehole and the collected material removed from the sampler. The samples were collected in a stainless-steel sampler lined with an acetate sleeve, which minimized sample handling and maintained sample integrity. Groundwater samples were obtained with a 1-inch diameter, stainless-steel groundwater sampler equipped with a 12-inch long, 0.010-inch slotted screen. The groundwater sampler was pushed to the selected sampling depth, retracted approximately 24 inches to open up the screen, and the void was allowed to fill. A piece of 0.25-inch diameter tubing was inserted into the screen assembly and attached to a transfer cap/bottle system. A vacuum was then placed on the transfer system, and the groundwater sample collected from the tubing after it was removed from the sampler.

4.1 Investigation of Soil and Groundwater

Nine sampling locations were proposed in the *Assembly C Site Investigation Plans* to define the nature and extent of contamination, if any, associated with the former sludge drying beds. Two sampling locations were placed in each cell of the sludge drying beds (Locations 1 through 8), and one location (Location 9) was placed north of the sludge drying beds in a presumed upgradient position. Figure 4-1 shows the sampling locations.

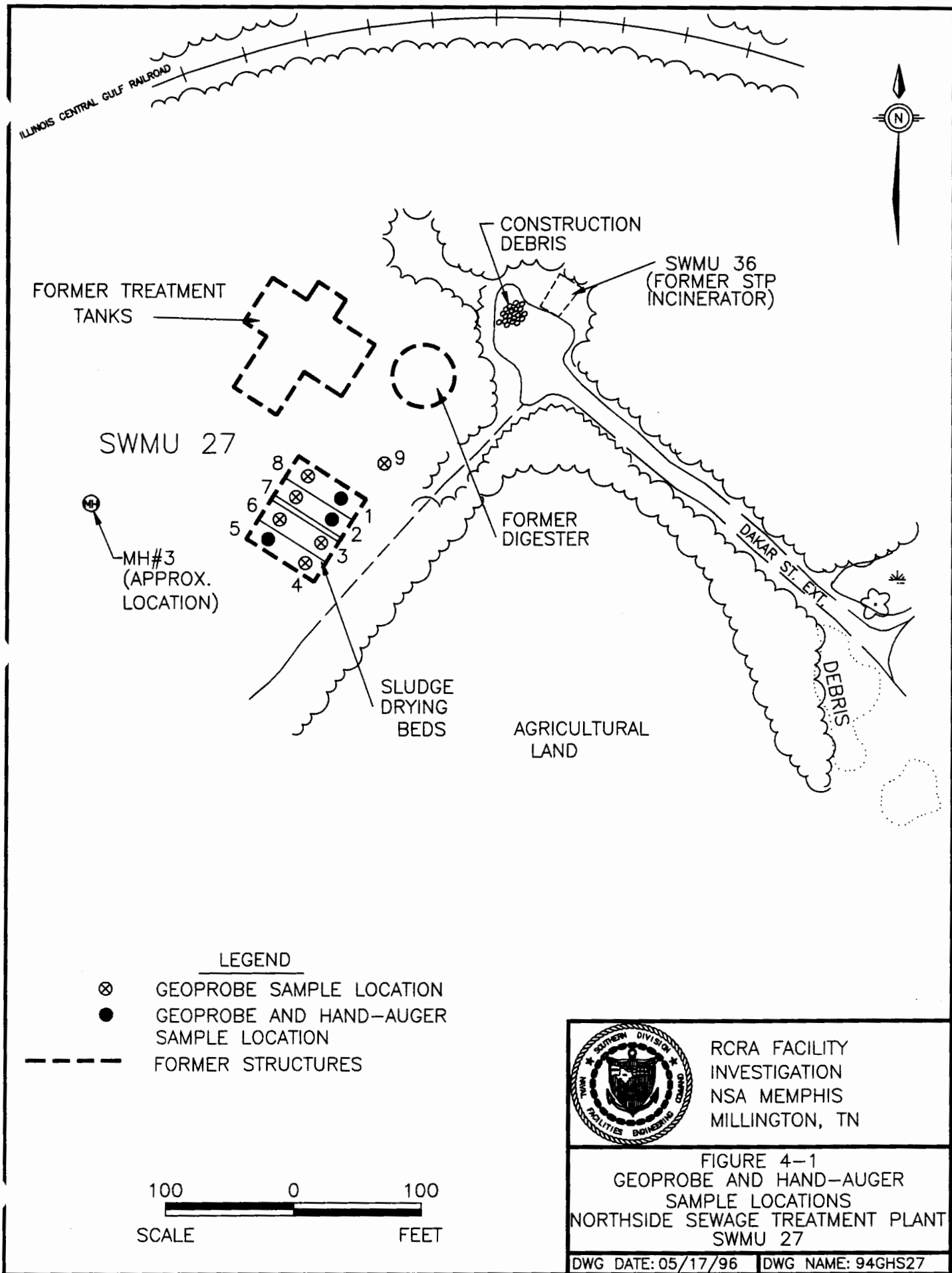
4.2 Sampling Rationale and Methods

The *Assembly C Site Investigation Plans* (E/A&H, 1995) stated that the following four soil/and or groundwater samples would be collected from each Geoprobe location during the CSI:

- One surface soil sample (0 to 1 foot bls);
- One soil sample from the native soil just beneath the bottom layer of filter bed aggregate;
- One sample, either soil or groundwater, from the soil-water interface in the loess; and
- One groundwater sample from the top of the fluvial deposits.

*Confirmatory Sampling Investigation Report
Assembly C — SWMU 27, Northside Sewage Treatment Plant
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996*

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*Confirmatory Sampling Investigation Report
Assembly C — SWMU 27, Northside Sewage Treatment Plant
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996*

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To determine the intervals to be sampled, the first Geoprobe boring (Location 1) was sampled continuously to 14 feet bls. In this boring, native soil was encountered at 4 feet bls, the soil/water interface in the loess at 13 feet bls, and fluvial deposits groundwater at 44 feet bls. Native soil in subsequent borings was encountered at 5 feet bls, and the soil/water interface in the loess between 11 and 12 feet bls. No groundwater samples could be collected from the loess. Based on field observations, the following intervals were selected for CSI sampling.

- One surface soil sample (0 to 1 foot bls)
- One subsurface soil sample from the native soil just beneath the bottom layer of filter bed aggregate (5 to 6 feet bls)
- One subsurface soil sample from the soil/water interface in the loess (11 to 12 feet bls)
- One groundwater sample from the top of the fluvial deposits (44 feet bls)

Exceptions to the above sampling intervals occurred at Location 1, where soil samples were collected from the 4- to 5-foot and 13- to 14-foot intervals, based on field observations. No fluvial deposits groundwater samples were collected from Locations 3, 4, and 7 due to the insufficient volume of groundwater which entered the sampler. These deviations were recorded in the field logbook.

During the Geoprobe investigation, Quality Assurance/Quality Control (QA/QC) samples were collected to test the level of reproducibility attainable in the sampling and analytical processes. QA/QC samples were analyzed for VOCs as were the associated environmental samples. Soil and groundwater *duplicate* samples collected at a frequency of 25% during the investigation were submitted to the offsite laboratory (NET) for confirmation analysis. The analytical results of the duplicate samples are discussed in Section 6, Nature and Extent of Contamination.

After reviewing the results of the Geoprobe investigation, three surface soil samples were proposed in the *Assembly C Confirmatory Sampling Investigation Report* (E/A&H, Revision 0, November 1995) to provide data needed to prepare a PRE. The samples were collected at Locations 1, 2, and 5 (refer to Figure 4-1) in the sludge drying beds. These locations were chosen based on the analytical results of the Geoprobe investigation (where USEPA residential or industrial risk-based concentrations [RBCs] for arsenic and beryllium had been exceeded in surface soil samples) and sampling accessibility.

An E/A&H geologist logged and processed the soil samples for submittal to the analytical laboratories. Tri-State collected the soil samples with the Geoprobe rig using the 1-inch diameter soil probe lined with an acetate sleeve. To minimize the potential loss of volatiles, soil samples for VOC analyses were placed in bottles immediately after collection. Soil samples for metals analyses were homogenized in a stainless-steel bowl in accordance with Section 4.2.10 of the Region IV USEPA Standard Operating Procedures/Quality Assurance Manual and containerized as outlined in Section 4.4.4 of the *Comprehensive RFI Work Plan*. Groundwater samples from the fluvial deposits were collected directly from the sampler and containerized in prepreserved vials. All samples were placed immediately on ice for transport to the onsite and offsite laboratories.

The sampling protocol adhered to the approved *Comprehensive RFI Work Plan* (E/A&H, 1994) and the *Assembly C Site Investigation Plans* (E/A&H, 1995). Sample handling was minimized. When transferring material from the sampling device to containers, the operation was conducted expediently, in as clean an environment as possible. A new pair of disposable gloves was donned before collecting each soil and groundwater sample. Empty containers were kept packaged until used, at which time they were immediately chilled and isolated in coolers.

4.3 Sample Processing and Chain-of-Custody Procedure

All samples collected in the field were labeled with a 10-digit alphanumeric code that identifies the site, sample type, sample location, and interval. The first three digits identify the site location, and the fourth digit identifies the sample matrix (S = soil, G = groundwater). The next four digits identify the sampling location, and the last two digits are the deepest point of the sampling interval. For example, the sample label "027S000212" designates a SWMU 27 soil sample collected from Location 2 at a maximum depth of 12 feet.

Clean sample containers provided by the testing laboratory were shipped to E/A&H in sealed packages. Sample containers were labeled with the sample identification number, date, sampler's name, and requested analytical parameter, then placed in a cooler immediately following collection. Each sample was logged in the field logbook. Samples for offsite laboratory analysis were prepared for shipment by wrapping each container individually in bubble wrap, placing it in a resealable plastic bag, and packing it on ice inside a sturdy cooler. Cooler lids were secured with packing tape and sealed with signed custody seals. Packaged samples were then shipped overnight via FedEx priority service for next morning delivery. The offsite laboratory was notified the day of shipment of the number of samples submitted. All sample shipments were reported to have arrived at NET in good condition and at the appropriate temperature.

To ensure the integrity of the sample transfer process, a strict chain-of-custody procedure was implemented. The procedure, initiated in the field, was conducted through custody transfer to the analytical laboratory. A chain-of-custody form was completed for each batch of samples, itemizing sample numbers, containerization, preservatives, analyses requested, date and time of sampling, and FedEx shipping number. Custody transfers were recorded by signature, date, and time of relinquishment, and receipt of custody by the parties involved.

4.4 Grouting Procedure

Tri-State filled each Geoprobe boring with neat cement grout following sample collection.

4.5 Decontamination Procedures

Tri-State decontaminated the downhole field equipment which did not come in contact with the samples (i.e., rods, split-spoons) with a nonphosphate detergent and a deionized, organic-free water rinse. All downhole equipment and sampling tools which could contact the collected samples were decontaminated before and after each use in accordance with guidelines set forth in the *Assembly C Site Investigation Plans*, which consisted of the following steps:

- Wash with a hot soap and water mixture
- Rinse with potable water
- Rinse with deionized organic-free water
- Rinse twice with pesticide-grade isopropyl alcohol
- Rinse with deionized organic-free water
- Wrap with aluminum foil or plastic

A new pair of disposable nitrile gloves was donned before handling decontaminated sampling equipment. Surface and subsurface soil samples were collected directly from the hand auger or the acetate sleeves within the stainless-steel sampler, and groundwater samples were collected directly from the groundwater sampler. Therefore, no investigation-derived waste was generated from these sampling activities.

5.0 GEOLOGY AND HYDROGEOLOGY

5.1 Regional Geology and Hydrogeology

The general hydrogeology of the Memphis area is discussed in detail in Section 2.11 and a conceptual model of the hydrogeology at the NSA is presented in Section 2.12 of the *Comprehensive RFI Work Plan* (E/A&H, 1994). Updated information is available in the *Hydrogeology of Post-Wilcox Group Stratigraphic Units in the Area of the Naval Air Station Memphis, Near Millington, Tennessee* (Kingsbury and Carmichael, 1995), provided in Attachment 2 of this document. On the basis of this updated information, the hydrogeology of NSA Memphis is re-summarized below.

The two stratigraphic units investigated during the RFIs at NSA Memphis are the loess/alluvial deposits of Pleistocene and Holocene age and the underlying fluvial deposits of Pleistocene to Pliocene age. The loess — eolian deposits consisting of silt, silty clay, clay, and minor amounts of sand — is the principal unit occurring at land surface throughout the NSA Memphis Northside. Alluvium, which is restricted to stream valleys, includes alluviated or reworked loess. The loess is typically 0 to 65 feet thick in the Memphis area; at NSA Memphis it ranges from 15 to 45 feet thick. Water-bearing zones are present in the loess primarily in the upper part of this unit; however, yields are low and water quality analyses performed during the water use survey portion of previous underground storage tank investigations indicate that loess groundwater does not meet many primary and secondary drinking water standards. Previous investigations at NSA Memphis have found depth to water in the loess varying between 5 and 15 feet bls and vertical hydraulic conductivities to range from 10^{-6} to 10^{-8} centimeters per second (cm/sec). Although the loess may be considered an aquitard on the basis of the relatively low hydraulic conductivities, this shallowest water-bearing zone is present within this interval. Groundwater flow in the loess is primarily downward, although locally some groundwater in the loess may discharge to nearby streams, drainage ditches, and other surface water bodies.

The fluvial deposits underlie the loess in upland areas and consist of sand, gravel, and some clay, with thin layers of ferruginous sandstone and conglomerate at the base. This unit ranges from 0 to 100 feet thick in the Memphis area; on the Northside of NSA Memphis it ranges from 10 to 60 feet thick and represents the most significant component of the surficial aquifer. Many shallow domestic wells in the Memphis rural areas are completed in the fluvial deposits. Relative groundwater elevations between wells completed in the loess/alluvium and fluvial deposits indicate semiconfined to confined conditions in the fluvial deposits. Typically a downward vertical gradient exists between water in the loess and the fluvial deposits. Sediments in the fluvial deposits generally coarsen with depth, and typically, the upper portion consists of a mixture of very fine sand with varying degrees of silt and clay and becomes increasingly less silty with depth, grading into a fine to medium sand near the middle of the unit. Grain sizes typically coarsen below this interval, grading into a gravelly sand near the fluvial deposits basal section.

The fluvial deposits are underlain by the Cockfield Formation, a part of the Jackson-upper Claiborne confining unit, which is a heterogeneous formation consisting of very fine silty sand interbedded with clay and silt lenses or clay with interbedded fine sand lenses. The Cockfield Formation ranges in thickness from approximately 35 to 180 feet in the NSA Memphis area. The more-permeable characteristics of the fluvial deposits, compared to the relatively impermeable properties of the overlying loess/alluvium and the underlying Jackson-upper Claiborne confining unit, result in the fluvial deposits being the preferential zone of groundwater flow and the route for contaminant transport in NSA Memphis's subsurface.

5.2 Site-Specific Geology and Hydrogeology

The following sections provide site-specific geologic and hydrogeologic information obtained from stratigraphic test borings, the Assembly A SWMU 60 RFI investigation, and the SWMU 27 Geoprobe investigation.

USGS Stratigraphic Test Boring

In 1994, the U.S. Geological Survey drilled the 200-foot deep stratigraphic test hole 4 approximately 500 feet south of the main runway and about 2,100 feet northeast of SWMU 27. Attachment 2 of this document contains a copy of the previously referenced Kingsbury and Carmichael publication, which provides a geologic cross-section showing test hole 4 (USGS designation Sh:U-99). The test hole was originally to be advanced approximately 15 feet into the Cook Mountain Formation (the confining unit separating the Memphis aquifer from the overlying Cockfield Formation and shallower units). However, due to the unanticipated thinness of the Cockfield Formation, this borehole was advanced approximately 50 feet into the Memphis Sand. Cuttings from the test hole were visually logged by a field geologist during drilling, and geophysical logs were run following completion of the hole. Lithologies encountered in the test hole were as follows:

Loess:	Approximately 40 feet of wind-blown silt deposits (loess) consisting of silt and clay.
Fluvial Deposits:	Approximately 30 feet of fluvial deposits consisting of sand and gravel.
Cockfield Formation:	Approximately 35 feet of alternating sand, clay, and some lignite.
Cook Mountain Formation:	The Cook Mountain, characterized as a brownish-gray to olive-gray dense clay approximately 50 feet thick, is defined as the upper confining unit between the surficial aquifers and the Memphis Sand aquifer.

SWMU 60 RFI

Shallow subsurface soil and groundwater information was collected while implementing the Assembly A RFI at SWMU 60, the Northside Landfill, approximately 500 feet east of SWMU 27. During the RFI, six soil borings were advanced and sampled, and 10 groundwater monitoring wells were installed, six in the loess and four in the lower fluvial deposits at various

locations just outside the landfill's perimeter. Attachment 2 contains a copy of the soil boring/monitoring well logs for the SWMU 60 RFI. The SWMU 60 RFI report is currently being prepared by E/A&H and will be submitted in final form later. Based on the information provided by the soil borings, silt and clay (loess) is present from ground surface to a depth of between 39 and 45 feet. Groundwater was first encountered in the loess at approximately 9 to 10 feet bls in all borings but was found to equilibrate within 3 or 4 feet of the surface in the completed wells, indicating confined groundwater conditions. A Shelby tube was collected from boring 60S0003 at the 20- to 22-foot depth interval. Geotechnical analysis of the sample indicated a vertical hydraulic conductivity of 1.7×10^{-7} cm/sec for the loess at this location. Grain-size analysis indicated a silty clay classification.

The top of the fluvial deposits contained silty sand and sand with alternating layers of sandy gravel and clay lenses. Gravel content typically increased with depth, as well as the sand grain-size distribution, which generally was fine in the upper part and coarse in the lower part. The base of the fluvial deposits/top of the Cockfield Formation was found to range between 75 and 96 feet bls. The top of the Cockfield was characterized by a grayish brown to pale brown clayey silt with a fine micaceous sand.

A specific capacity of 0.91 gallons per minute per foot of drawdown was calculated during a pump test of well 60MW04LF (approximately 800 feet southeast of SWMU 27), screened in the lower fluvial deposits. Using this specific capacity and an aquifer thickness of 55 feet at this location, a hydraulic conductivity of approximately 15 feet per day (ft/day) was determined. Horizontal groundwater velocities in the lower fluvial deposits have been estimated from SWMU 60's specific capacity data to range from 0.085 to 0.16 ft/day while the horizontal groundwater velocity in the loess at the Aviation Fire Fighting Training Facility (SWMU 5) approximately 3,000 feet southeast of SWMU 27, was estimated to be approximately 0.0014 ft/day (or 0.5 feet per year) (E/A&H, 1992).

Groundwater elevations were measured in SWMU 60 monitoring wells on March 31 and September 6, 1995. On these dates, the groundwater flow direction in the loess was south-southeast with a horizontal gradient ranging from 0.013 to 0.034 feet/foot. Groundwater in the lower part of the fluvial deposits flowed northwest with a relatively flat gradient ranging between 0.0016 to 0.003 feet/foot. Relative groundwater elevations between wells screened in the loess and fluvial deposits indicated a downward gradient from the loess to the fluvial deposits.

SWMU 27 CSI

During the Geoprobe investigation, E/A&H collected soil samples continuously to 14 feet bls at Location 1 for visual observation and lithologic description. The field geologist described the lithology encountered during the Geoprobe investigation as brown silty clay and clay (loess). The water-bearing zone in the loess (11 to 13 feet bls) was visually classified as a silty clay. Groundwater was encountered at 44 feet in the upper part of the fluvial deposits.

*Confirmatory Sampling Investigation Report
Assembly C — SWMU 27, Northside Sewage Treatment Plant
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996*

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6.0 NATURE AND EXTENT OF CONTAMINATION

This section provides the analytical results for surface soil (0 to 1 foot bls), subsurface soil (> 1 foot bls), and groundwater samples collected during the CSI. As outlined in Section 4, E/A&H collected surface and subsurface soil samples from three intervals at each of the nine sampling locations shown on Figure 4-1. Each of the samples were analyzed for VOCs and Appendix IX metals. Additional surface soil collected at three of the nine sampling locations was analyzed for SVOCs and pesticides/PCBs. Six groundwater samples were collected from the upper part of the fluvial deposits. Hydrologic's onsite laboratory analyzed the soil and groundwater samples for VOCs, and NET analyzed the soil samples for SVOCs, pesticides/PCBs, and Appendix IX Metals.

Detected concentrations of organic compounds and metals have been compared with media-specific guidance concentrations from the USEPA Region III RBC Table (July to December 1995) to evaluate the risk associated with exposure to soil and groundwater contaminants and to evaluate the transfer potential of contaminants from soil to groundwater. In addition, metals concentrations for the soil samples are compared with established reference concentrations (RCs) derived from background samples at NSA Memphis to determine if they represent naturally occurring concentrations. Background RC calculations were provided in the *Technical Memorandum — Assemblies A through D Background Reference Concentrations*, E/A&H, September 18, 1996). Detected concentrations of VOCs in groundwater are compared with RBCs for tap water (USEPA Region III RBC Table, July to December 1995) and maximum contaminant levels (MCLs) for drinking water (USEPA Drinking Water Regulations and Health Advisories, May 1995).

Specifically, surface soil sample results are compared with RCs, residential and industrial RBCs, and soil screening values (SSLs); whereas subsurface soil sample results are compared with RCs and SSLs only. Groundwater samples are compared with RBCs for tap water and MCLs for drinking water.

Section 6.1 briefly discusses the criteria used to determine the RCs (two times the mean background concentration) for metals. Section 6.2 summarizes the detected contaminants in surface and subsurface soil. Contaminants identified in surface soil are further evaluated in the Preliminary Risk Evaluation (Section 7). Section 6.3 summarizes the detected contaminants in groundwater. Soil and groundwater contaminants detected at SWMU 27 are summarized in Section 6.4.

6.1 Background Reference Concentrations

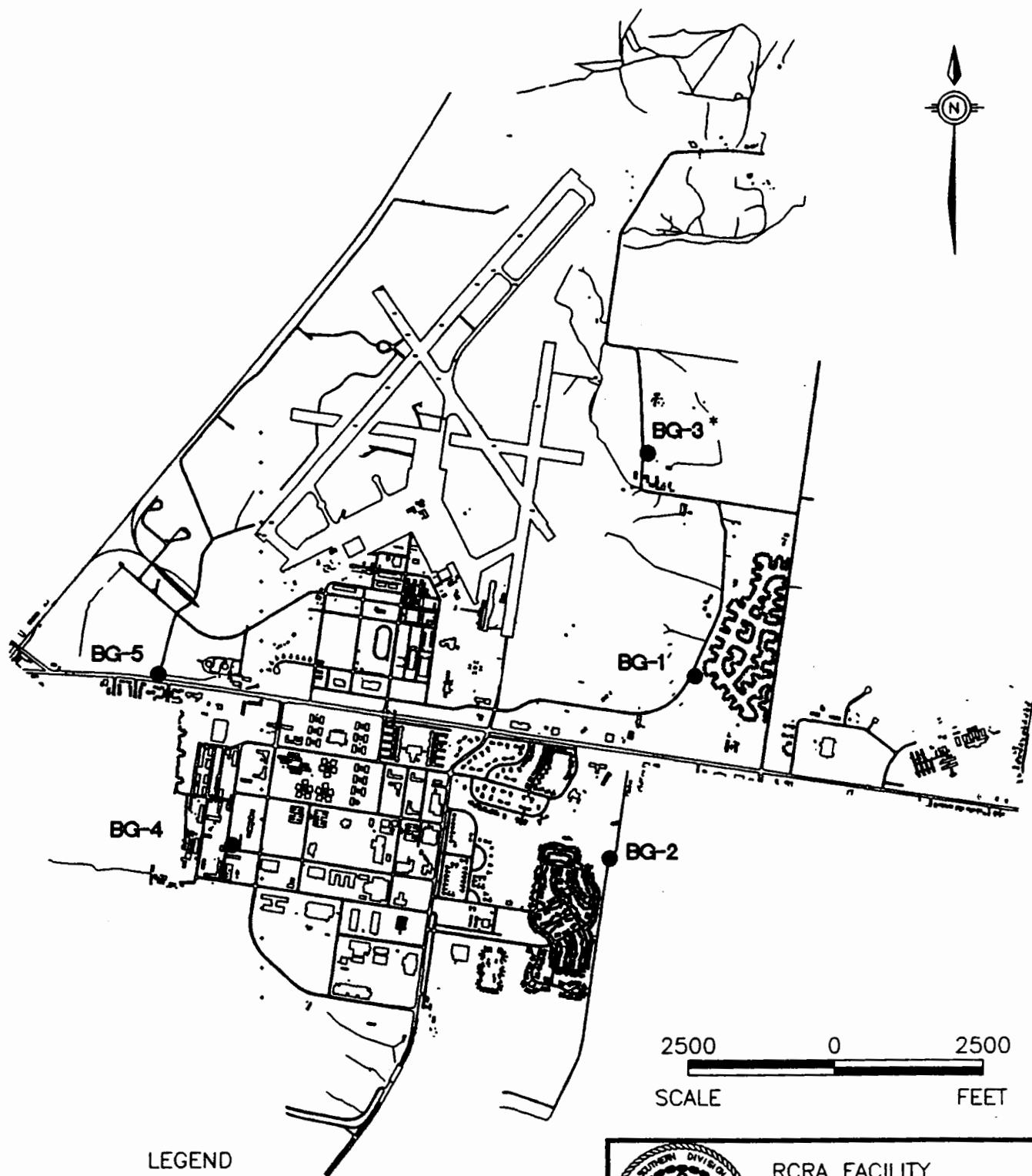
Background locations were established at five areas at NSA Memphis (shown on Figure 6-1) to determine ambient soil and groundwater quality conditions. Background data for soil consist of 12 samples collected from five boring locations. The background RC for each metal was calculated by doubling the mean concentration detected. Two RCs were established for soil — one for surface soil (0 to 1 foot bls) and one for subsurface soil (> 1 foot bls). Tables 6-1 and 6-2 show the RCs for metals detected in surface and subsurface soil, respectively.

6.2 Soil Sample Analytical Results

The following sections summarize the results of soil samples collected during the CSI. Appendix A contains the analytical data.

6.2.1 Surface Soil Samples

E/A&H collected nine surface soil samples from the 0 to 1 foot bls. Each sample was analyzed for VOCs and Appendix IX metals. Three of the samples were also analyzed for pesticides/PCBs and SVOCs. Figure 4-1 shows the sampling locations, and Table 6-1 summarizes the detected contaminant concentrations.



LEGEND

* SOIL BACKGROUND DATA ONLY

BG-2 BACKGROUND LOCATION 2

NOTE: SOIL DATA CONSIST OF ONE SURFACE & TWO SUBSURFACE SOIL SAMPLES. GROUNDWATER DATA CONSIST OF THREE SAMPLES; THE LOESS, UPPER FLUVIAL & LOWER FLUVIAL DEPOSITS.



RCRA FACILITY
INVESTIGATION
NSA MEMPHIS
MILLINGTON, TN

FIGURE 6-1
SOIL & GROUNDWATER
BACKGROUND LOCATIONS

*Confirmatory Sampling Investigation Report
Assembly C — SWMU 27, Northside Sewage Treatment Plant
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996*

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Confirmatory Sampling Investigation Report
Assembly C — SWMU 27, Northside Sewage Treatment Plant
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996

Table 6-1
Detected Concentrations of VOCs, Pesticides, SVOCs, and Metals in Surface Soil
SWMU 27 — Northside Sewage Treatment Plant
(data in milligrams per kilogram)

Analyte	1 (0 - 1') 027S000101	2 (0 - 1') 027S000201	3 (0 - 1') 027S000301	4 (0 - 1') 027S000401	5 (0 - 1') 027S000501	RC ^a 0 - 1'	SSL ^b	RBC ^c Residential	RBC ^c Industrial
Organic Compounds									
Isopropylbenzene/ Bromobenzene ^d	ND ^a	ND	0.0058	ND	ND	— ^f	—	—	—
Aldrin	ND	0.0097 J ^a	N/A ^a	N/A	ND	—	0.005	0.038	0.34
Heptachlor epoxide	0.0032 J	0.019	N/A	N/A	0.006 J	—	0.03	0.07	0.63
Dieldrin	0.2 D ^a	1.2 D	N/A	N/A	0.71 D	—	0.001	0.04	0.36
Endrin	ND	0.0081 J	N/A	N/A	0.0045	—	0.4	23	610
4,4'-DDD	ND	ND	N/A	N/A	0.0026	—	0.7	2.7	24
4,4'-DDT	0.0071 J	0.019 J	N/A	N/A	0.014 J	—	1	1.9	17
alpha-Chlordane	0.019	0.12 D	N/A	N/A	ND	—	2	0.49	4.4
gamma-Chlordane	0.0081	ND	N/A	N/A	ND	—	2	0.49	4.4
Technical chlordane	0.11	0.67	N/A	N/A	ND	—	2	0.49	4.4
Naphthalene	ND	0.25 J	N/A	N/A	ND	—	30	3,100	82,000
2-Methylnaphthalene	ND	0.063 J	N/A	N/A	ND	—	30 ^g	3,100 ^g	82,000 ^g
Acenaphthylene	ND	0.043 J	N/A	N/A	0.045 J	—	200 ^h	4,700 ^h	120,000 ^h
Acenaphthene	ND	0.3 J	N/A	N/A	ND	—	200	4,700	120,000
Dibenzofuran	ND	0.24 J	N/A	N/A	ND	—	120	310	8,200
Fluorene	ND	0.38 J	N/A	N/A	ND	—	160	3100	82000
Phenanthrene	ND	3	N/A	N/A	0.36 J	—	1,400 ⁱ	2,300 ⁱ	61,000 ⁱ
Anthracene	ND	0.64	N/A	N/A	0.094 J	—	4,300	23,000	610,000
Carbazole	ND	0.6	N/A	N/A	0.04 J	—	0.5	32	290
Fluoranthene	0.079 J	2.9	N/A	N/A	0.63	—	980	3,100	82,000
Pyrene	0.079 J	2.4	N/A	N/A	0.56	—	1,400	2,300	61,000
Benzo(a)anthracene	0.041 J	1.4	N/A	N/A	0.32 J	—	0.7	0.88	7.8
Chrysene	0.05 J	1.3	N/A	N/A	0.31 J	—	1	88	780
Benzo(b)fluoranthene	0.05 J	1.2	N/A	N/A	0.33 J	—	4	0.88	7.8
Benzo(k)fluoranthene	0.05 J	0.89	N/A	N/A	0.28 J	—	4	8.8	78
Benzo(a)pyrene	0.051 J	1.1	N/A	N/A	0.29 J	—	4	0.088	0.78
Indeno(1,2,3-cd)pyrene	ND	0.52	N/A	N/A	0.14 J	—	35	0.88	7.8
Dibenz(a,h)anthracene	ND	0.23 J	N/A	N/A	0.043 J	—	11	0.088	0.78
Benzo(g,h,i)perylene	0.041 J	0.53	N/A	N/A	0.16 J	—	1,400 ⁱ	2,300 ⁱ	61,000 ⁱ
Metals									
Antimony	19.1 J	18.5 J	ND	ND	ND	ND	—	31	820
Arsenic	33 J	15.9 J	4.9	ND	9.4	13.2	15	0.43	3.8
Barium	153 J	109 J	111	225	202	191	32	5,500	140,000
Beryllium	1.2 J	0.97 J	0.83 J	0.68 J	0.45 J	0.96	180	0.15	1.3
Cadmium	1.3 J	ND	0.97 J	1.6	0.82 J	ND	6	39	1,000
Chromium	9 J	5.5 J	8.6	17	11.2	26.4	19	390	10,000
Cobalt	ND	ND	3.2 J	5.8 J	8 J	20.6	—	4,700	120,000
Copper	13.5 J	14.3 J	17.6	38.4	23.5	27	—	3,100	82,000
Lead	40.4	22.9	40.9	60.5	43.7	28.7	None ^a	None ^a	None ^a
Mercury	1.6	0.3	1.2	1.7	0.75	2.3	3	23	610
Nickel	ND	ND	9.1 J	11 J	18.7	ND	21	1,600	41,000
Selenium	0.48 J	ND	ND	ND	ND	ND	3	390	10,000
Silver	6.6 J	ND	ND	8.4 J	2.3 J	ND	—	390	10,000
Vanadium	9.7 J	12.7 J	11.1 J	17.7	15.4	49.6	—	550	14,000
Zinc	178	69.7	155	239	138	88.3	42,000	23,000	610,000
Tin	12.1 J	5.5 J	ND	22.1 J	ND	ND	—	47,000	1,000,000

Confirmatory Sampling Investigation Report
Assembly C — SWMU 27, Northside Sewage Treatment Plant
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996

Table 6-1
Detected Concentrations of VOCs, Pesticides, SVOCs, and Metals in Surface Soil
SWMU 27 — Northside Sewage Treatment Plant
(data in milligrams per kilogram)

Analyte	6 (0 - 1') 027S000601	7 (0 - 1') 027S000701	8 (0 - 1') 027S000801	9 (0 - 1') 027S000901	RC ^a 0 - 1'	SSL ^b	RBC ^c Residential	RBC ^c Industrial
Organic Compounds								
Isopropylbenzene/ Bromobenzene ^d	ND	ND	ND	ND	—	—	—	—
Metals								
Antimony	ND	ND	ND	ND	ND	—	31	820
Arsenic	7.7	4	10.6	11.2	13.2	15	0.43	3.8
Barium	120	148	110	52.7	191	32	5,500	140,000
Beryllium	0.65 J	ND	0.41 J	0.33 J	0.96	180	0.15	1.3
Cadmium	ND	0.97	ND	1.1 J	ND	6	39	1,000
Chromium	16.4	6.7	12.8	9.7	26.4	19	390	10,000
Cobalt	6.6 J	ND	7.9 J	5.4 J	20.6	—	4,700	120,000
Copper	11	38.3	8.8	11.3	27	—	3,100	82,000
Lead	30.6	277	24.7	10.2	28.7	None ^e	None ^e	None ^e
Mercury	0.25	3.1	0.13	ND	2.3	3	23	610
Nickel	14.9	ND	14.8	10.2	ND	21	1,600	41,000
Selenium	ND	ND	ND	0.5 J	ND	3	390	10,000
Silver	ND	15.8 J	ND	ND	ND	—	390	10,000
Vanadium	19.1	2.8 J	18.3	26.1	49.6	—	550	14,000
Zinc	86.8	163	49.1	31.6	88.3	42,000	23,000	610,000
Tin	ND	ND	ND	ND	ND	—	47,000	1,000,000

Notes:

- ^a RC = Reference concentration (2 x the mean background concentration). Background concentrations were established for the 0 to 1-foot and the greater than 1-foot intervals below land surface using analytical data from 12 soil samples collected from five background soil boring locations at various locations on the Northside and Southside of NSA Memphis (*Technical Memorandum — Assemblies A through D Background Reference Concentrations*, E/A&H, September 18, 1996).
- ^b SSL = Soil Screening Level; RBC = Risk-Based Concentration. Values obtained from the USEPA Region III RBC Table, July to December 1995.
- ^c RBC = Risk-Based Concentration; obtained from the USEPA Region III Risk-Based Concentration Table, July to December 1995.
- ^d = The onsite laboratory instrumentation could not distinguish between these two VOCs due to similar retention times for these compounds.
- ^e ND = denotes analyte was not detected.
- ^f — = No guidance concentration exists for this analyte.
- ^g J = denotes concentration is estimated.
- ^h N/A = denotes sample was not analyzed for this parameter.
- ⁱ D = indicates sample was diluted prior to analysis.
- ^j = No RBCs exist for 2-methylnaphthalene; the RBCs for naphthalene were used as surrogates.
- ^k = No RBCs exist for acenaphthylene; the RBCs for acenaphthene were used as surrogates.
- ^l = No RBCs exist for phenanthrene and benzo(g,h,i)perylene; the RBCs for pyrene were used as surrogates.
- ^m = Although no there is no published SSL or RBC for lead, USEPA has published a recommended soil screening concentration of 400 milligrams per kilogram (mg/kg) for residential land use and 1,000 mg/kg for industrial land use (Office of Solid Waste and Emergency Response Directive 9355.4-12).

Bold indicates analyte exceeds the RC.

Italics indicates analyte exceeds the soil screening level.

Bold and Italics indicates analyte exceeds both the RC and the SSL.

LARGE PRINT indicates analyte exceeds the residential RBC.

LARGE PRINT AND BOLD indicates analyte exceeds both the RC and the residential RBC.

Table 6-2
Detected Concentrations of VOCs and Metals in Subsurface Soil
SWMU 27 — Northside Sewage Treatment Plant
(data in milligrams per kilogram)

Analyte	1 (4 - 5')	1 (12 - 14')	2 (5 - 6')	2 (11 - 12')	3 (5 - 6')	3 (11 - 12')	4 (5 - 6')	4 (11 - 12')	5 (5 - 6')	RC ^a > 1'	SSL ^b
	027S000105	027S000114	027S000206	027S000212	027S000306	027S000312	027S000406	027S000412	027S000506		
Organic Compounds											
Isopropylbenzene/ Bromobenzene ^c	ND ^d	ND	ND	ND	ND	ND	ND	ND	ND	—	—
Metals											
Antimony	20.4 J	ND	18 J	ND	ND	ND	ND	ND	ND	ND	—
Arsenic	11.9 J	6.4 J	13.2 J	5.3 J	6.3	10.6	10.3	10	5.6	20.4	15
Barium	160 J	72.9 J	191 J	73.8 J	197	131	163	100	121	289	32
Beryllium	0.42 J	0.34 J	0.54 J	0.33 J	0.61 J	0.46 J	0.46 J	0.41 J	0.34 J	1.02	180
Cadmium	2.6 J	2.2 J	2.4 J	1.3 J	ND	ND	ND	ND	ND	6.8	6
Chromium	9.4 J	6.4 J	10.3 J	7.4 J	14.3	13.8	11.6	10.8 J	9.9	28.6	19
Cobalt	8.1 J	7.4 J	11.9 J	8 J	11.7 J	7.2 J	10 J	8.7 J	6.1 J	15.3	—
Copper	17.5 J	12.7 J	18 J	16.1 J	10	12.4	11.7	12.9	7.1	33.9	—
Lead	12.6	8.5	14.5	10.7	7.7	11.9	11.6	11.7	7	25.1	None ^e
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.38	3
Nickel	20.8 J	15.1 J	26.3 J	16.5 J	22.7	24	28.1	20.1	14.9	59.8	21
Selenium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	—
Vanadium	19.9 J	14.6 J	22.5 J	15.6 J	20.8	24.6	18.8	17.3	14.4	46.3	—
Zinc	54.2	39.9	60.8	51.1	47.1	57	54.5	53.1	39.5	111.8	42000
Tin	ND	5.5 J	4.4 J	ND	ND	ND	ND	ND	ND	ND	—

Confirmatory Sampling Investigation Report
Assembly C — SWMU 27, Northside Sewage Treatment Plant
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996

Table 6-2
Detected Concentrations of VOCs and Metals in Subsurface Soil
SWMU 27 — Northside Sewage Treatment Plant
(data in milligrams per kilogram)

Analyte	5 (11 - 12')	6 (5 - 6')	6 (11 - 12')	7 (5 - 6')	7 (11 - 12')	8 (5 - 6')	8 (11 - 12')	9 (5 - 6')	9 (11 - 12')	RC ^a > 1'	SSL ^b
	027S000512	027S000606	027S000612	027S000706	027S000712	027S000806	027S000812	027S000906	027S000912		
Organic Compounds											
Isopropylbenzene/ Bromobenzene	ND	0.0411	ND	ND	ND	ND	ND	ND	ND	—	—
Metals											
Antimony	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	—
Arsenic	5.1	8.9	5.1	7	8.7	14.2	9.2	13.7	7.9	20.4	15
Barium	115	294	110	167	151	138	77.8	134	60.1	289	32
Beryllium	0.4 J	0.59 J	0.39 J	0.46 J	0.38 J	0.44 J	0.3 J	0.47 J	0.28 J	1.02	180
Cadmium	ND	ND	ND	ND	ND	ND	0.99 J	1.9 J	ND	6.8	6
Chromium	15	16.7	13.4	15	13.5	10.2	6.7 J	10	4.9 J	28.6	19
Cobalt	5.1 J	8.7 J	4.2 J	7 J	7.6 J	9.3 J	6.5 J	7.1 J	5.7 J	15.3	—
Copper	7.9	13.1	8.6	7.7	7.4	11.8	12.9	18.1	13.2	33.9	—
Lead	7.8	9.4	6.1	7.8	10.6	14.5	9.4	13	9	25.1	None ^c
Mercury	ND	ND	ND	ND	0.11	ND	ND	ND	ND	0.38	3
Nickel	14.9	33.1	14.4	19.6	19.4	21.8	23.2	26.6	17.5	59.8	21
Selenium	ND	ND	ND	ND	ND	ND	0.53 J	ND	0.53 J	ND	3
Silver	ND	ND	ND	ND	ND	ND	ND	ND	0.97 J	ND	—
Vanadium	17.5	30	12.9	23.5	19.8	17.2	12.5 J	18.9	13.1	46.3	—
Zinc	45.9	73.4	55.5	45.4	58.5	89.2 J	40	59	38	111.8	42000
Tin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	—

Notes:

- ^a RC = Reference concentration (2 x the mean background concentration). Background concentrations were established for the 0 to 1-foot interval and the greater than 1-foot intervals below land surface using analytical data from 12 soil samples collected from five background soil boring locations at various locations on the Northside and Southside of NSA Memphis (*Technical Memorandum — Assemblies A through D Background Reference Concentrations*, E/A&H, September 18, 1996).
- ^b SSL = Soil Screening Level; obtained from the USEPA Region III RBC Table, July to December, 1995.
- ^c = The onsite laboratory instrumentation could not distinguish between these two VOCs due to similar retention times for these compounds.
- ^d ND = denotes analyte was not detected.
- ^e — = No guidance concentration exists for this analyte.
- ^f J = denotes concentration is estimated.
- ^g Although no there is no published SSL for lead, USEPA has published a recommended soil screening concentration of 400 milligrams per kilogram (mg/kg) for residential land use and 1,000 mg/kg for industrial land use (Office of Solid Waste and Emergency Response Directive 9355.4-12).

Bold indicates analyte exceeds the RC.

Italics indicates analyte exceeds the SSL.

Bold and Italics indicates analyte exceeds both the RC and the SSL.

VOCs

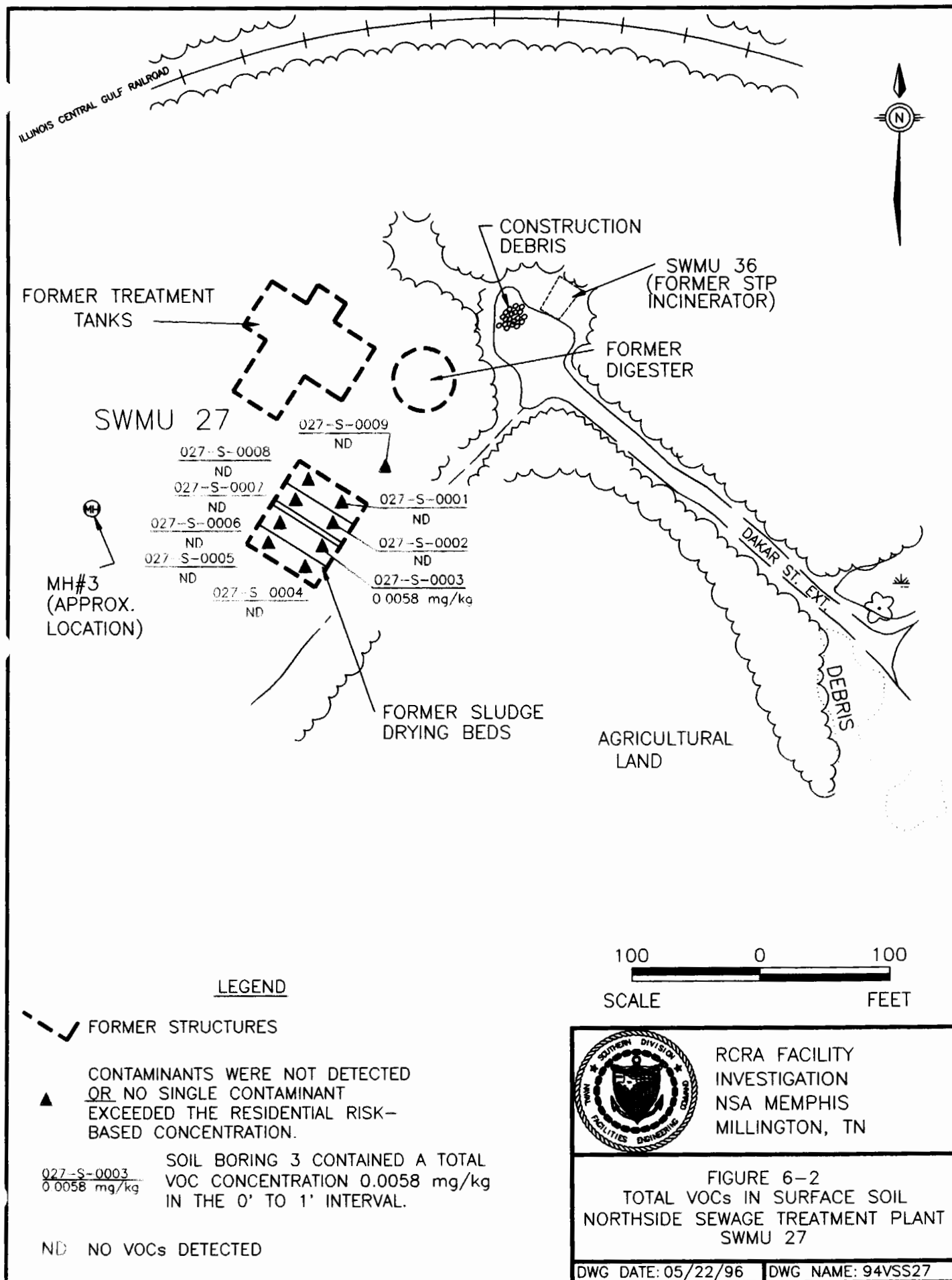
The only VOCs detected in surface soil were isopropylbenzene/bromobenzene at Location 3 (0.0058 milligrams per kilogram [mg/kg]). These two compounds could not be distinguished by the onsite laboratory instrumentation due to similar retention times. No RC, SSL, or RBC exists for either of these compounds. Figure 6-2 provides a plot of total VOC concentrations in surface soil, and Table 6-1 summarizes the detected concentrations.

Pesticides/PCBs

Eight pesticides were detected in the three surface soil samples. Dieldrin was detected in all three surface soil samples at concentrations ranging from 0.2 mg/kg to 1.2 mg/kg, which exceeds the industrial RBC and the SSL. The June 2, 1995, Technical Memorandum *Discussion of Dieldrin Risk Management Issues* (E/A&H, 1995) provides the results of a background study for dieldrin concentrations at NSA Memphis. A copy of this technical memorandum is provided in Attachment 3. As outlined in the technical memorandum, dieldrin is ubiquitous to NSA Memphis due to its basewide aerial application during the 1950s and 1960s to control the spread of white-fringed beetles. The average background concentration of dieldrin in soil was 0.131 mg/kg, with a maximum detected concentration of 0.311 mg/kg. Risk estimates based on the background soil dieldrin concentrations at NSA Memphis did not exceed the 1E-4 Incremental Lifetime Excess Cancer Risk (ILCR) threshold established by the USEPA. As stated in the memorandum, "This finding indicates that dieldrin levels found at each SWMU do not necessitate remedial action in the absence of other significant carcinogenic risk contributors." In addition, because of the chemical properties of dieldrin and the physical properties of soil, it is not expected to leach in appreciable quantities (if at all) into underlying groundwater. Although the maximum detected dieldrin concentration at SWMU 27 (1.2 mg/kg) exceeds the average background concentration of 0.131 mg/kg, the risk ratio outlined in the PRE in Section 7 (3E-5 for residential carcinogens and 3.3E-6 for industrial carcinogens) still does not exceed the 1E-4 ILCR standard.

*Confirmatory Sampling Investigation Report
Assembly C — SWMU 27, Northside Sewage Treatment Plant
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996*

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Aldrin was detected above the SSL, but did not exceed residential or industrial RBCs. No other detected pesticide exceeded RBCs or SSLs. No PCBs were detected in the surface soil samples. Figure 6-3 provides a plot of total pesticides concentrations in surface soil and indicates whether industrial and residential RBCs for individual pesticides are exceeded at each location. Table 6-1 lists each detected concentration.

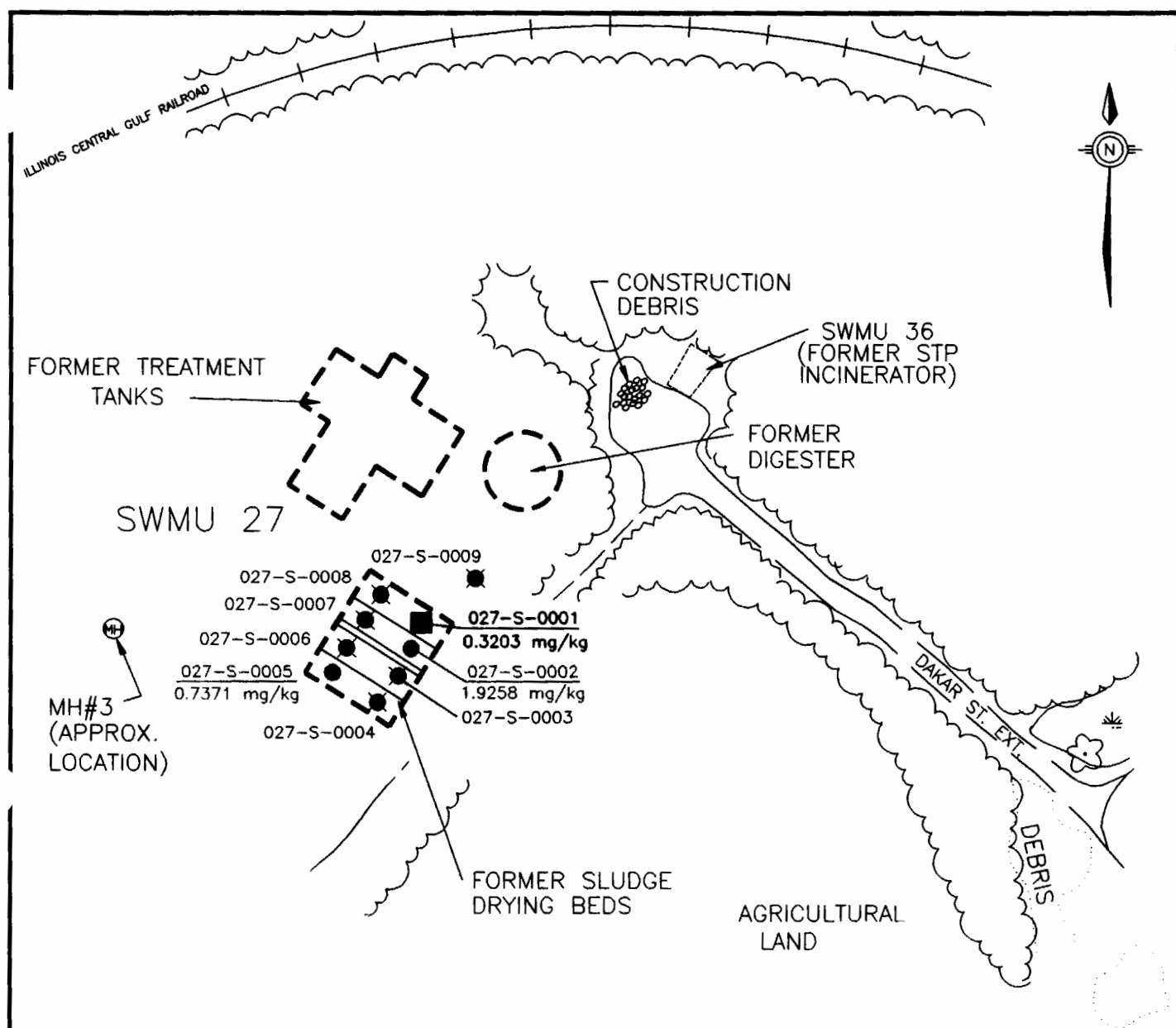
SVOCs

Nineteen SVOCs were detected in the three surface soil samples. At Location 2, the benzo(a)pyrene concentration (1.1 mg/kg) exceeded the industrial RBC (0.78 mg/kg) but did not exceed the SSL (4 mg/kg). The benzo(a)pyrene concentration at Location 5 (0.29 mg/kg) exceeded the residential RBC (0.088 mg/kg) but not the SSL. The concentration of benzo(a)anthracene (1.4 mg/kg) exceeded both the residential RBC (0.88 mg/kg) and the SSL (0.7 mg/kg) at Location 2. Benzo(b)fluoranthene (1.2 mg/kg) and dibenz(a,h)anthracene (0.23 mg/kg) exceeded the residential RBCs (0.88 mg/kg and 0.088 mg/kg, respectively) but not the SSLs (4 mg/kg and 11 mg/kg, respectively) at Location 2. The chrysene concentration at Location 2 (1.3 mg/kg) exceeded the SSL (1 mg/kg) but not the residential RBC (88 mg/kg). Figure 6-4 provides a plot of total SVOC concentrations in surface soil and indicates whether residential and industrial RBCs for individual SVOCs are exceeded at each location. Table 6-1 lists each detected concentration.

Metals

Sixteen metals were detected in the surface soil samples, most of which exceeded their background reference concentration (RC, or two times the mean background concentration) at NSA Memphis. Arsenic, detected at each sampling location, exceeded the RC (13.2 mg/kg), industrial RBC (3.8 mg/kg), and the SSL (13.2 mg/kg) at Locations 1 (33 mg/kg detected) and 2 (15.9 mg/kg). The arsenic concentration also exceeded the industrial RBC but not the RC or SSL at Locations 3, 5, 6, 7, 8, and 9. Beryllium was identified at concentrations above the residential RBC in most samples; however, the background RC of beryllium exceeds the residential RBC. No other metal exceeded its residential RBC.

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LEGEND

- ▲ CONTAMINANTS WERE NOT DETECTED OR NO SINGLE CONTAMINANT EXCEEDED THE RESIDENTIAL RISK-BASED CONCENTRATION.
- ONE OR MORE CONTAMINANTS WERE DETECTED THAT EXCEEDED RESIDENTIAL RISK-BASED CONCENTRATIONS BUT DID NOT EXCEED INDUSTRIAL RISK-BASED CONCENTRATIONS.
- ONE OR MORE CONTAMINANTS WERE DETECTED THAT EXCEEDED RESIDENTIAL AND INDUSTRIAL RISK-BASED CONCENTRATIONS.
- SAMPLE WAS NOT ANALYZED FOR PESTICIDES.

027-S-0001
0.3203 mg/kg

SOIL BORING 1 CONTAINED A TOTAL PESTICIDES CONCENTRATION OF 0.3203 mg/kg.

FORMER STRUCTURES

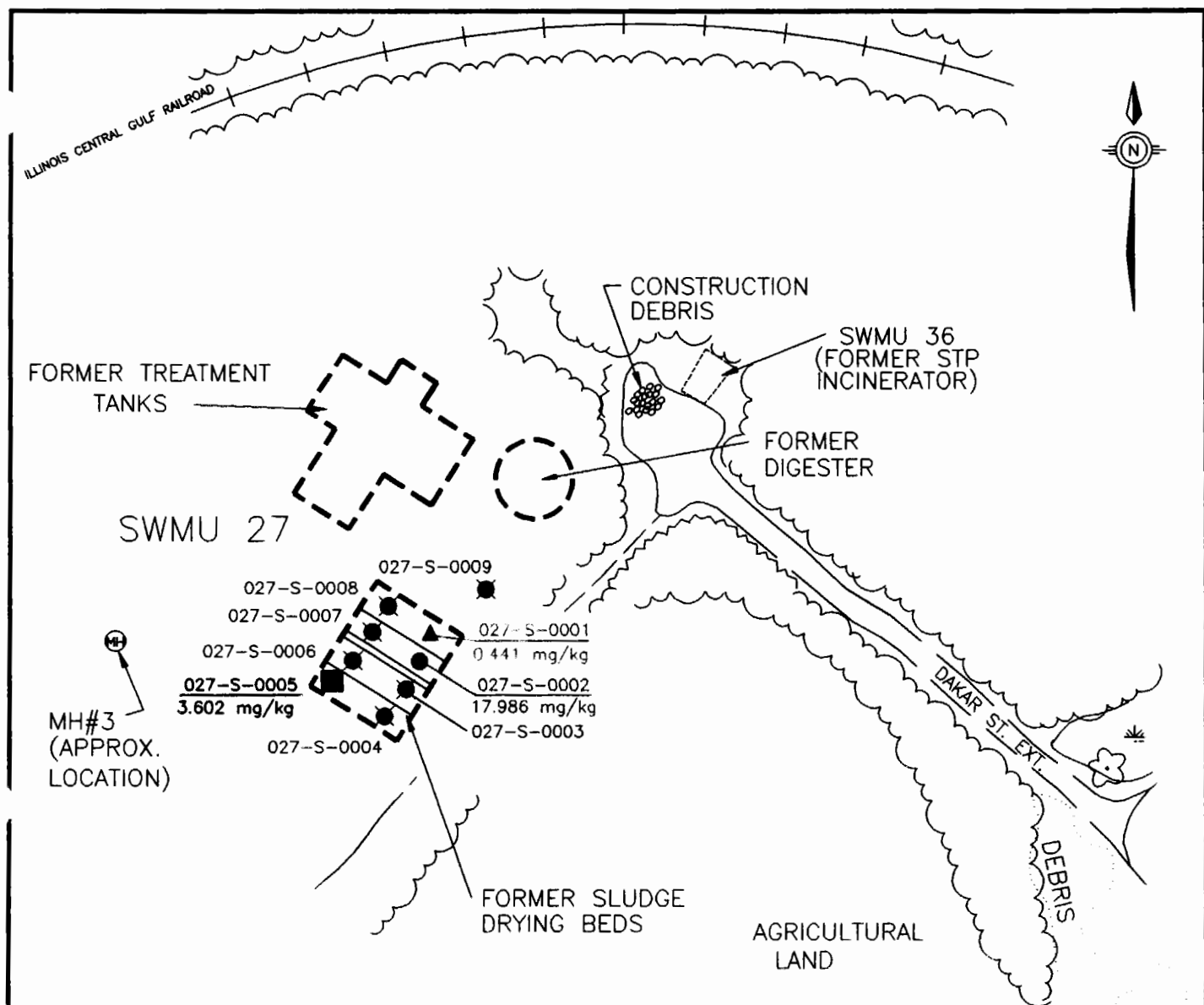
100 0 100
SCALE FEET



RCRA FACILITY
INVESTIGATION
NSA MEMPHIS
MILLINGTON, TN

FIGURE 6-3
TOTAL PESTICIDES IN SURFACE SOIL
NORTHSIDE SEWAGE TREATMENT PLANT
SWMU 27

DWG DATE: 05/22/96 DWG NAME: 94TPS27



LEGEND

- ▲ CONTAMINANTS WERE NOT DETECTED OR NO SINGLE CONTAMINANT EXCEEDED THE RESIDENTIAL RISK-BASED CONCENTRATION.
- ONE OR MORE CONTAMINANTS WERE DETECTED THAT EXCEEDED RESIDENTIAL RISK-BASED CONCENTRATIONS BUT DID NOT EXCEED INDUSTRIAL RISK-BASED CONCENTRATIONS.
- ONE OR MORE CONTAMINANTS WERE DETECTED THAT EXCEEDED RESIDENTIAL AND INDUSTRIAL RISK-BASED CONCENTRATIONS.
- SAMPLE WAS NOT ANALYZED FOR SVOCs.

027-S-0005
3.602 mg/kg

SOIL BORING 5 CONTAINED A TOTAL SVOC CONCENTRATION OF 3.602 mg/kg.

FORMER STRUCTURES

100 0 100
SCALE FEET



RCRA FACILITY
INVESTIGATION
NSA MEMPHIS
MILLINGTON, TN

FIGURE 6-4
TOTAL SVOCs IN SURFACE SOIL
NORTHSIDE SEWAGE TREATMENT PLANT
SWMU 27

DWG DATE: 05/22/96 DWG NAME: 94TSS27

The SSL for barium was exceeded in every sample; however, the background RC for barium was only exceeded at two sampling locations. The SSL and RC for mercury were exceeded at one location. Figure 6-5 provides a plot of metals concentrations in surface soil samples compared with their RCs and RBCs, and Table 6-1 summarizes the detected metals concentrations in surface soil.

6.2.2 Subsurface Soil Samples

E/A&H collected 18 subsurface soil samples from two intervals at each of the nine sampling locations. The samples were analyzed for VOCs and Appendix IX metals. Figure 4-1 shows the sampling locations, and Table 6-2 summarizes the detected contaminant concentrations.

VOCs

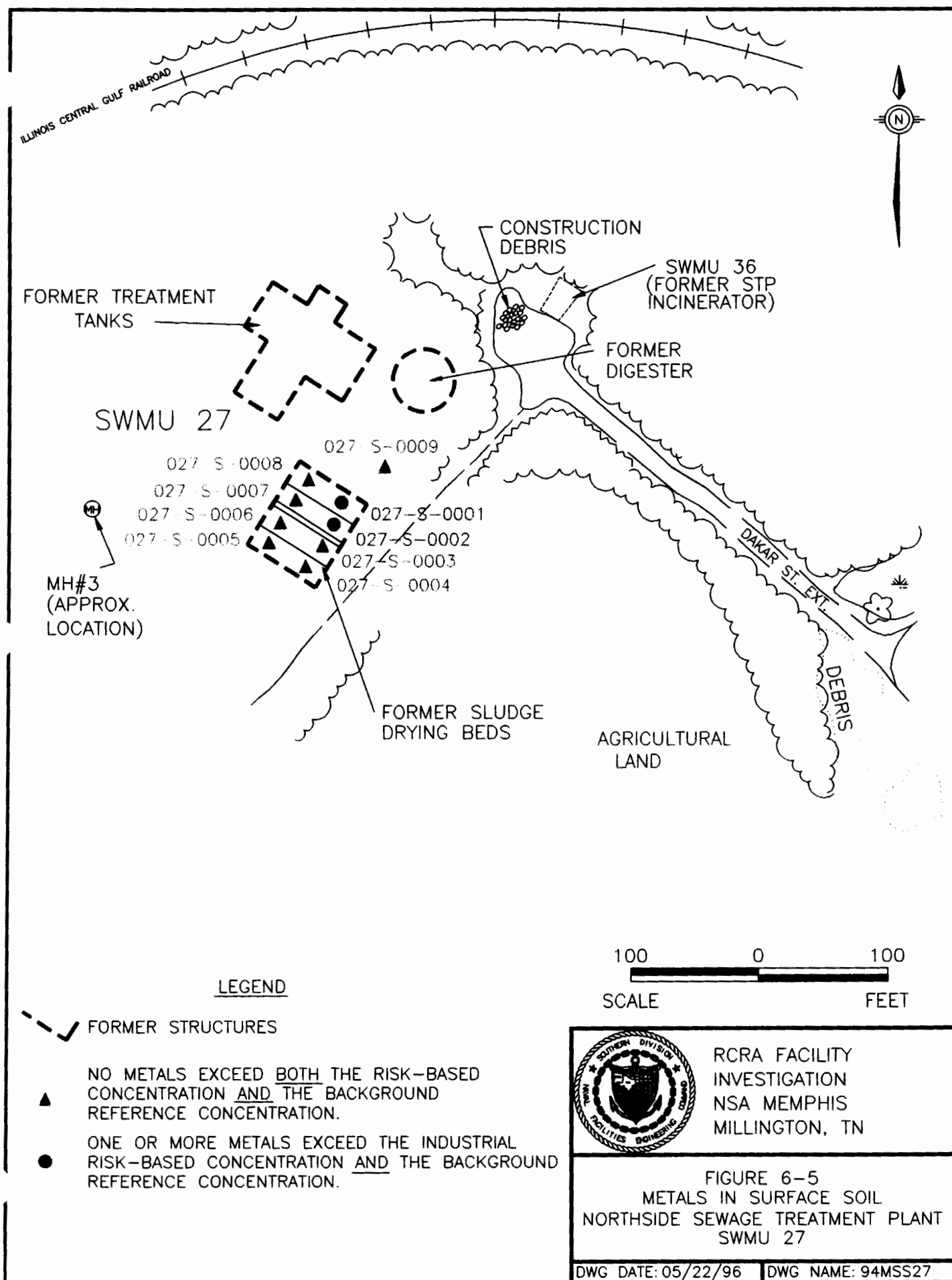
The only VOCs detected in subsurface soil samples were isopropylbenzene/bromobenzene at Location 6 (0.0411 mg/kg, 5- to 6-foot interval). These VOCs were detected by the onsite laboratory only. The laboratory instrumentation could not distinguish between the two VOCs because of similar retention times for these compounds. No RBC exists for either isopropylbenzene or bromobenzene.

Metals

Sixteen metals were detected in the subsurface soil samples. Barium exceeded its SSL (32 mg/kg) and its RC (289 mg/kg) at Location 6 (294 mg/kg) only. No other subsurface soil sample exceeded both the RC and SSL. Antimony was detected at Location 1 (20.4 mg/kg; 4 to 5 feet bls) and Location 2 (18 mg/kg; 5 to 6 feet bls) at concentrations exceeding the RC (not detected). No SSL exists for antimony. Tin was detected at Location 1 (5.5 mg/kg; 12 to 14 feet bls) and Location 2 (4.4 mg/kg; 5 to 6 feet bls) at concentrations exceeding the RC (not detected). No SSL exists for tin.

*Confirmatory Sampling Investigation Report
Assembly C — SWMU 27, Northside Sewage Treatment Plant
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996*

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6.3 Groundwater Results

No VOCs were identified in groundwater by the onsite laboratory. The only VOCs identified in groundwater by the offsite laboratory were in duplicate samples submitted for confirmation analysis. At Location 5, 7 micrograms per liter ($\mu\text{g/L}$) acetone and 1 $\mu\text{g/L}$ toluene were identified in groundwater from the upper fluvial deposits. At Location 9, 18 $\mu\text{g/L}$ acetone and 2 $\mu\text{g/L}$ carbon disulfide were detected. Acetone is a common laboratory artifact. No RBCs for tap water or MCLs for drinking water were exceeded by VOCs detected in groundwater. Figure 6-6 provides a plot of VOCs in groundwater compared with their RBCs and MCLs, and Table 6-3 summarizes the detected VOCs in groundwater.

6.4 Summary of Nature and Extent

Analytical results indicate minimal contamination, if any, by VOCs in soil and groundwater. No VOC concentration in surface soil exceeded its RBC or SSL. No VOC concentration in subsurface soil exceeded its RBC or SSL. No VOC concentration in groundwater exceeded either the RBC for tap water or the MCL for drinking water.

Eight pesticides were detected in the three surface soil samples. The dieldrin concentration in two surface soil samples exceeded the industrial RBC and the SSL and exceeded the residential RBC and the SSL in the third sample. However, dieldrin is ubiquitous to NSA Memphis due to its basewide aerial application during the 1950s and 1960s. Aldrin was detected above the SSL in one surface soil sample, but it did not exceed its residential RBC.

Nineteen SVOCs were detected in the three surface soil samples. Benzo(a)pyrene exceeded its industrial RBC at one location and its residential RBC at a second location. Benzo(a)anthracene exceeded both the residential RBC and the SSL at one location. Benzo(b)fluoranthene and dibenz(a,h)anthracene exceeded the residential RBC at one location. Chrysene exceeded its SSL at one location.

Confirmatory Sampling Investigation Report
Assembly C — SWMU 27, Northside Sewage Treatment Plant
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996

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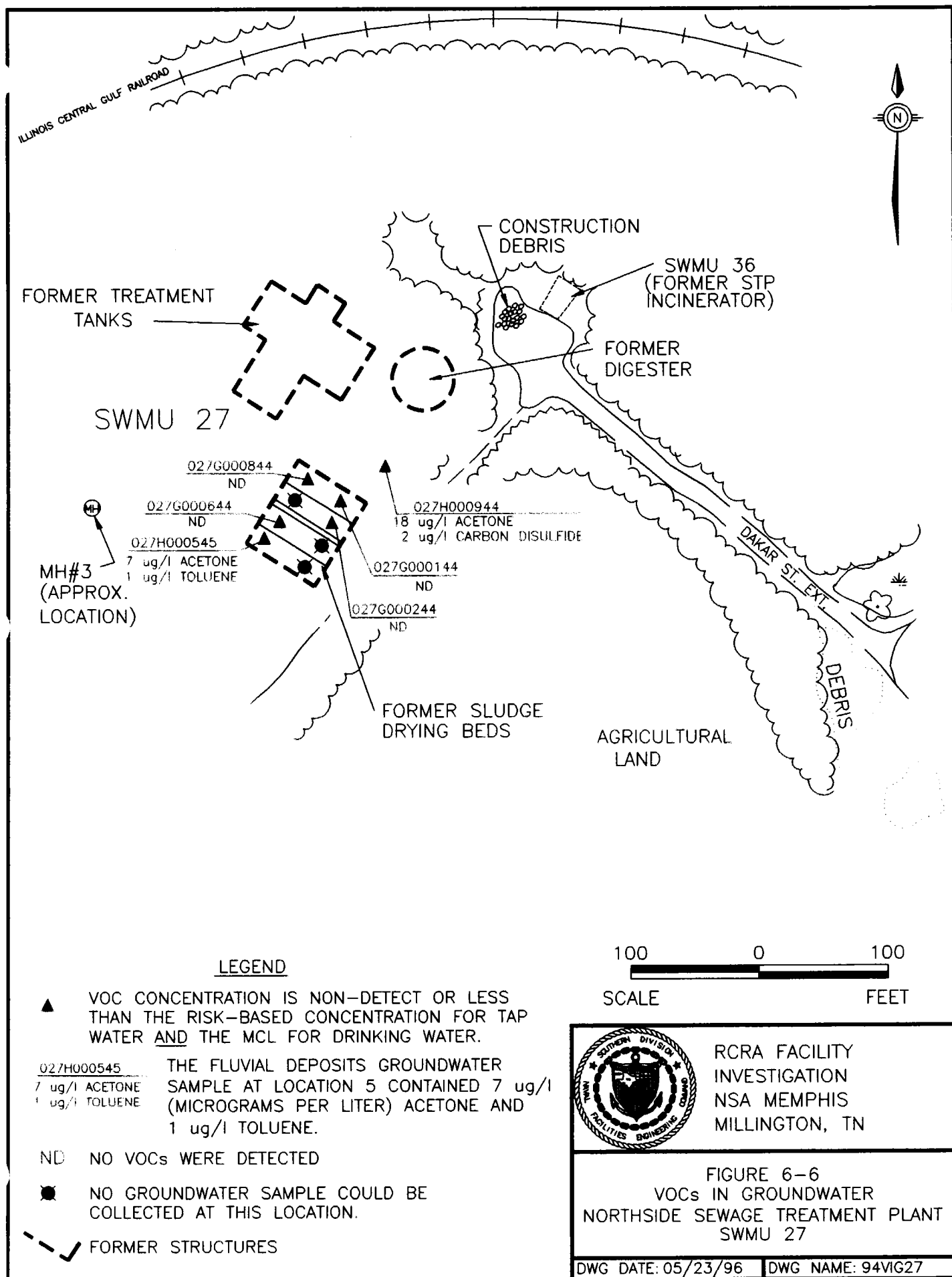


Table 6-3
Detected Concentrations of VOCs in Groundwater
SWMU 27 — Northside Sewage Treatment Plant
(data in micrograms per liter)

Analyte	Sample Location/ID		RBC ^a Tap Water	MCL ^b Drinking Water
	5 (44' to 45') 027H000545	9 (43' to 44') 027H000944		
Acetone	7 J ^c	18	3,700	— ^d
Carbon Disulfide	ND ^e	2 J	1,000	—
Toluene	1 J	ND	750	1,000

Notes:

- ^a RBC = Risk-Based Concentration; obtained from the USEPA Region III Risk-Based Concentrations Table, July to December 1995.
- ^b MCL = Maximum Contaminant Level for Drinking Water; obtained from the USEPA Drinking Water Regulations and Health Advisories, May 1995.
- ^c J = Estimated concentration
- ^d — = No guidance concentration exists for this analyte.
- ^e ND = Analyte was not detected.

Sixteen metals were detected in the surface soil samples, most of which exceeded their background RC. Arsenic exceeded the RC, the SSL, and the industrial RBC at two locations. Beryllium was identified at concentrations above the residential RBC in most samples; however, the background RC of beryllium exceeds the residential RBC. No other metal exceeded its residential RBC. The background RC and the SSL were exceeded at two sampling locations for barium and at one location for mercury.

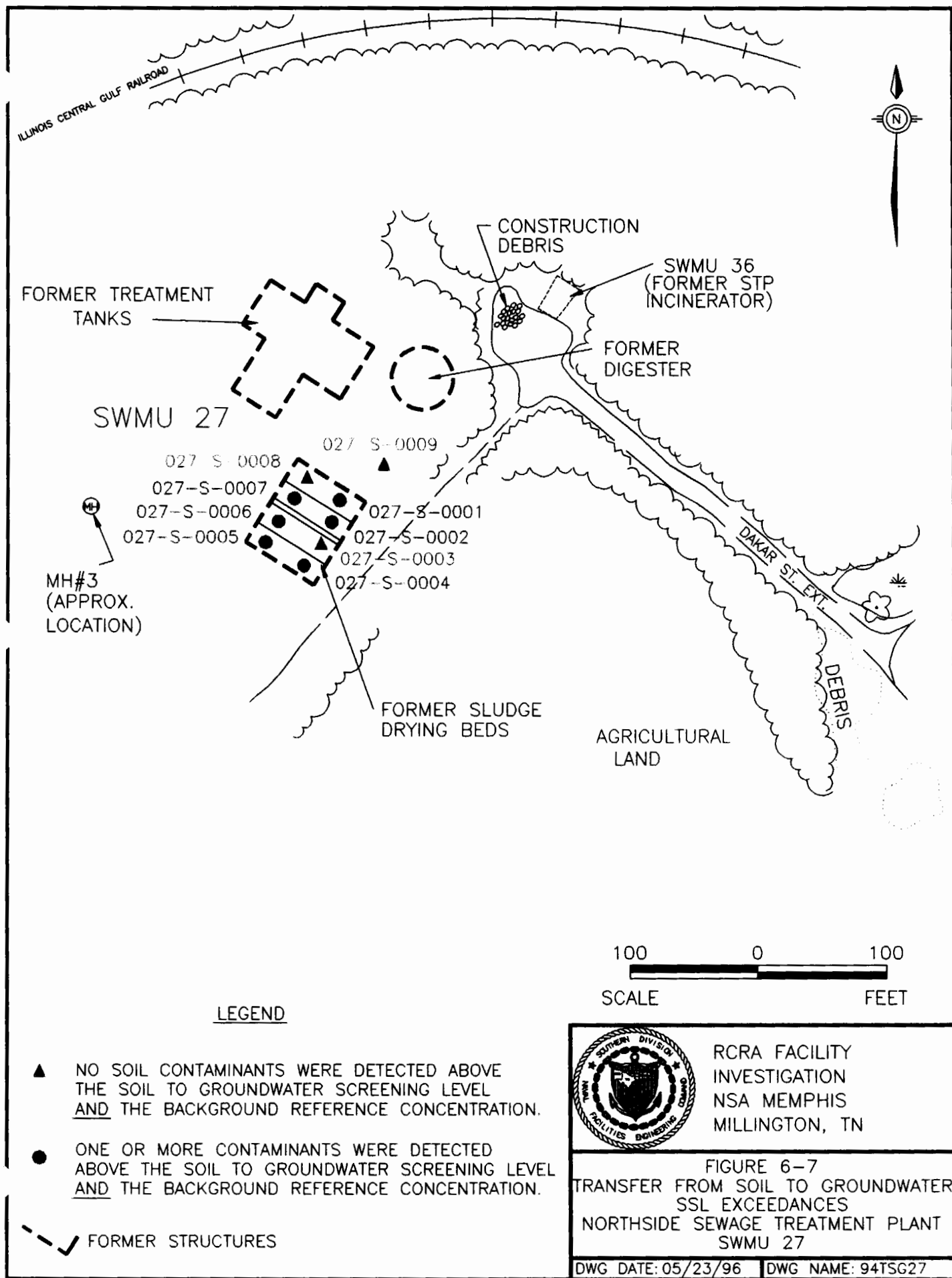
Sixteen metals were detected in the subsurface soil samples. Barium exceeded the SSL and the RC in one sample. Antimony and tin, which do not have SSLs, exceeded their RCs in two subsurface soil samples each.

Contaminant Transfer from Soil to Groundwater

Tables 6-1 and 6-2 provide SSL values for transfer from surface and subsurface soil to groundwater. Figure 6-7 illustrates that both RCs and SSLs were exceeded by one or more contaminants at sample locations 1, 2, 4, 5, 6, and 7.

Confirmatory Sampling Investigation Report
Assembly C — SWMU 27, Northside Sewage Treatment Plant
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996

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7.0 PRELIMINARY RISK EVALUATION

In accordance with *Guidance on Preliminary Risk Evaluations for the Purpose of Reaching a Finding of Suitability to Lease* (USEPA Region IV Memorandum, November 1994), a PRE was conducted for SWMU 27 to finalize the RCRA closure of the SWMU.

Nine surface soil samples were collected; two sampling locations were in each of the four cells comprising the sludge drying beds and one location north of the sludge drying beds in a presumed upgradient location. Each of the samples were analyzed for VOCs (USEPA Method 8021 by the onsite laboratory) and Appendix IX metals (USEPA Method 6010/7000 series). Additional surface soil collected at three of the nine sampling locations was analyzed for SVOCs (USEPA Method 8270) and pesticides/PCBs (USEPA Method 8080).

A PRE is conducted by constructing a table for carcinogenic and systemic (noncarcinogenic) compounds. The maximum concentration for each detected chemical and its corresponding RBC concentration is entered into the table to calculate cumulative human health risk. Soil data used in the calculations are exclusively from samples collected across the surface soil interval (0 to 1 foot bls).

Proportionate risk is calculated for each detected site chemical by comparing its maximum reported concentration with the corresponding RBC value. Risk and hazard for residential and commercial scenarios were calculated separately. RBC values were calculated by USEPA based on a risk threshold of 10^{-6} for carcinogens or a hazard quotient threshold of 1.0 for noncarcinogens. Therefore, a risk ratio is calculated for each contaminant by one of the following two equations:

$$\text{Carcinogenic Risk Ratio: } RR = \frac{\text{media concentration}}{\text{screening value}} \times TR$$

$$\text{Noncarcinogenic Risk Ratio: } RR = \frac{\text{media concentration}}{\text{screening value}} \times THQ$$

where:

RR	=	the risk ratio
Media Concentration	=	the maximum concentration of a site chemical
Screening Value	=	the RBC value for that particular chemical
TR	=	target risk used by USEPA to calculate RBCs for carcinogens (10 ⁻⁶)
THQ	=	target hazard quotient used by USEPA to calculate RBCs for noncarcinogens (1.0)

Tables 7-1 and 7-2 summarize PRE results for SWMU 27 for carcinogens and noncarcinogens, respectively. The risk ratios for each chemical are summed separately for both residential and commercial scenarios to determine the overall site risk. Cumulative risk (for carcinogens) and cumulative hazard index (HI) (for noncarcinogens) are calculated separately, and the cumulative risk and HI are each compared to the corresponding cumulative threshold in accordance with the USEPA Region IV Memorandum, November 1994.

If the carcinogenic ILCR is greater than 10⁻⁴ (the cumulative risk threshold) or the noncarcinogenic HI is greater than 1 (the cumulative HI threshold), the site may require additional investigation for the corresponding land use scenario (USEPA Region IV Memorandum, November 1994). If neither threshold is exceeded, the property is considered suitable to lease for the specified land use scenario.

Table 7-1
Preliminary Risk Evaluation for SWMU 27
Residential and Commercial Carcinogens
NSA Memphis RFI

Parameter	Reference Concentration (mg/kg)	Maximum (mg/kg)	Residential RBC Carcinogen (mg/kg)	Risk Ratio	Commercial RBC Carcinogen (mg/kg)	Risk Ratio
Acenaphthene		0.3				
Acenaphthylene		0.045				
Aldrin		0.0097				
Anthracene		0.094				
Antimony	ND	19.1				
Arsenic	13.1	33	0.43	7.7E-05	3.8	8.7E-06
Barium	19.1	225				
Benzo(a)anthracene		0.32	0.88	3.6E-07	7.8	4.1E-08
Benzo(a)pyrene		0.29	0.088	3.3E-06	0.78	3.7E-07
Benzo(b)anthracene		0.33	0.88	3.8E-07	7.8	4.2E-08
Benzo(g,h,i)perylene		0.16				
Benzo(k)fluoranthene		0.28	8.8	3.2E-08	78	3.6E-09
Beryllium	0.96	1.2	0.15	8.0E-06	1.3	9.2E-07
Cadmium	ND	1.6				
Carbazole		0.04	32	1.3E-09	290	1.4E-10
Chromium	26.4	17				
Chrysene		0.31	88	3.5E-09	780	4.0E-10
Cobalt	15	8				
Copper	23.6	38.4				
4,4'-DDD		0.0026	2.7	9.6E-10	24	1.1E-10
4,4'-DDT		0.019	1.9	1.0E-08	17	1.1E-09
Dibenzo(a,h)anthracene		0.23	0.088	2.6E-06	0.78	2.9E-07
Dibenzofuran		0.24				
Dieldrin		1.2	0.04	3.0E-05	0.36	3.3E-06
Endrin		0.0081				
Fluoranthene		0.63				
Fluorene		0.24				
Heptachlor epoxide		0.019	0.07	2.7E-07	0.63	3.0E-08
Indeno(1,2,3-cd)pyrene		0.14	0.88	1.6E-07	7.8	1.8E-08
Lead	28.7	277	400		1000	
2-Methylnaphthalene		0.063				
Mercury	1.1	3.1				
Naphthalene		0.25				
Nickel	1.1	18.7				
Phenanthrene		0.36				
Pyrene		0.56				
Selenium	ND	0.5				
Silver	ND	15.8				
Technical chlordane		0.67	4.4	1.5E-07	0.49	1.4E-06
Tin		22.1				
Vanadium	49.6	26.1				
Zinc	88.3	239				
		ILCR	SUM	1E-04	SUM	2E-05

NOTES:

- ILCR Incremental excess lifetime cancer risk
- HI Hazard index
- Blank spaces Indicates not applicable
- ND Not detected
- All concentrations are in parts per million (mg/kg).
- The maximum concentration reported for each contaminant was used to develop the table above.
- Soil sample data were from the surface (0-1') interval only.
- Screening values (RBCs) are from the July to December 1995 Risk-Based Concentration (RBC) Table (October 20, 1995 USEPA Region III RBC memo).
- The maximum lead (Pb) concentration reported at SWMU 27 was 277 mg/kg. This is less than the 400 mg/kg residential soil screening level for total lead (USEPA OSWER Directive 9355.4-12). The RBC for naphthalene was used as a surrogate for acenaphthalene, which does not have an RBC.
- The RBC for pyrene was used as a surrogate for phenanthrene and benzo(g,h,i)perylene, which do not have RBCs.
- The technical chlordane concentration was used rather than the individual isomer concentrations to provide a conservative estimate.
- Metal was excluded from the risk ratio because the maximum reported concentration is less than the corresponding reference concentration.

Table 7-2
Preliminary Risk Evaluation for SWMU 27
Residential and Commercial Noncarcinogens
NSA Memphis RFI

Parameter	Reference Concentration (mg/kg)	Maximum (mg/kg)	Residential RBC Noncarcinogen (mg/kg)	Hazard Ratio	Commercial RBC Noncarcinogen (mg/kg)	Hazard Ratio
Acenaphthene		0.3	4700	6.38E-05	120000	2.50E-06
Acenaphthylene		0.045	3100	1.45E-05	82000	5.49E-07
Aldrin		0.0097	0.038	0.2553	0.34	0.029
Anthracene		0.094	23000	4.09E-06	610000	1.54E-07
Antimony	ND	19.1	31	0.6161	820	0.023
Arsenic	13.1	33	23	1.4348	610	0.054
Barium	19.1	225	5500	0.0409	140000	0.0016
Benzo(a)anthracene		0.32				
Benzo(a)pyrene		0.29				
Benzo(b)anthracene		0.33				
Benzo(g,h,i)perylene		0.16	2300	6.96E-05	61000	2.62E-06
Benzo(k)fluoranthene		0.28				
Beryllium	0.96	1.2				
Cadmium	ND	1.6	39	0.0410	1000	0.0016
Carbazole		0.04				
* Chromium	26.4	17	390		10000	
Chrysene		0.31				
* Cobalt	15	8	4700		120000	
Copper	23.6	38.4	3100	0.0124	82000	0.00047
4,4'-DDD		0.0026				
4,4'-DDT		0.019				
Dibenzo(a,h)anthracene		0.23				
Dibenzofuran		0.24	310	0.0008	8200	2.93E-05
Dieldrin		1.2				
Endrin		0.0081	23	0.00035	610	1.33E-05
Fluoranthene		0.63	3100	0.00020	82000	7.68E-06
Fluorene		0.24	3100	0.00008	82000	2.93E-06
Heptachlor epoxide		0.019				
Indeno(1,2,3-cd)pyrene		0.14				
Lead	28.7	277				
2-Methylnaphthalene		0.063	3100	2.03E-05	82000	7.68E-07
Mercury	1.1	3.1	23	0.13	610	0.0051
Naphthalene		0.25	3100	0.0001	82000	3.05E-06
Nickel	1.1	18.7	1600	0.0117	41000	0.00046
Phenanthrene		0.36	2300	0.00016	61000	5.90E-06
Pyrene		0.56	2300	0.00024	61000	9.18E-06
Selenium	ND	0.5	390	0.0013	10000	5.00E-05
Silver	ND	15.8	390	0.0405	10000	0.0016
Technical chlordane		0.67				
Tin		22.1	47000	0.0005	1000000	0.0000
* Vanadium	49.6	26.1	550		14000	
Zinc	88.3	239	23000	0.0104	610000	0.00039
		HI	SUM	3	SUM	0.12

NOTES:

- ILCR Incremental excess lifetime cancer risk
- HI Hazard index
- Blank spaces Indicates not applicable
- ND Not detected
- All concentrations are in parts per million (mg/kg).
- The maximum concentration reported for each contaminant was used to develop the table above.
- Soil sample data were from the surface (0-1') interval only.
- Screening values (RBCs) are from the July to December 1995 Risk-Based Concentration (RBC) Table (October 20, 1995 USEPA Region III RBC memo).
- The maximum lead (Pb) concentration reported at SWMU 27 was 277 mg/kg. This is less than the 400 mg/kg residential soil screening level for total lead (USEPA OSWER Directive 9355.4-12). The RBC for naphthalene was used as a surrogate for acenaphthalene, which does not have an RBC.
- The RBC for pyrene was used as a surrogate for phenanthrene and benzo(g,h,i)perylene, which do not have RBCs.
- The technical chlordane concentration was used rather than the individual isomer concentrations to provide a conservative estimate.
- * Metal was excluded from the risk ratio because the maximum reported concentration is less than the corresponding reference concentration.

This PRE does not evaluate the potential exposure that might be experienced by construction workers should site structures be excavated in the future. This would require an acute or subchronic assessment of subsurface soil data. For the site worker scenario, USEPA recommends an exposure duration of 25 years — a chronic exposure scenario. Exposure durations less than seven years, as would be assumed for a construction worker scenario, are considered acute or subchronic. Assuming a construction worker is exposed to subsurface soil for three years, cumulative risk and hazard estimates would be approximately one order of magnitude less than those presented in this PRE.

USEPA used chronic-based toxicological information when calculating RBCs, or USEPA makes conservative adjustments to reflect chronic exposure. In addition to the effect the exposure duration differences would have on a construction worker's cumulative risk and hazard estimates, toxicological information used by USEPA to calculate RBCs would be adjusted to reflect acute or subchronic toxicological endpoints rather than the chronic endpoints typically used. Acute and subchronic thresholds are based on lower exposure durations than chronic thresholds, and higher concentrations are generally necessary to elicit observable toxic effects. Higher thresholds for toxic effects result in less conservative toxicological information, which would be used to adjust RBCs for either acute or subchronic exposure. Because a construction worker would be exposed under either acute or subchronic conditions, and RBCs based on chronic exposure are generally more conservative, the commercial site worker scenario presented in this PRE would be a more conservative scenario than that for a construction worker.

The maximum concentrations reported in SWMU 27 soil were generally from 0 to 1 foot bls, and exposure to maximum reported soil concentrations would occur within that interval. Therefore, the cumulative risk and hazard estimates presented in this PRE are conservative for most reported chemicals relative to subsurface soil.

According to the Base Reuse and Development Plan (RKG Associates Inc., 1995), SWMU 27, the site of a former sewage treatment plant, will likely be developed as a commercial property. Surface soil samples were collected from the former sewage sludge drying beds, which would most likely be sinks for contaminants. Due to the nature of this proposed use, a commercial setting can be assumed to evaluate risk. With respect to the commercial scenario, the resulting ILCR and HI were below the established criteria of 10^{-4} and 1, respectively. The ILCR estimated for the residential scenario was approximately equal to the 10^{-4} ILCR threshold, and the HI of 3 for the residential scenario exceeded the established threshold of 1.

Conclusions and Recommendations

Based on the information gathered during this investigation, the following conclusions and recommendations have been reached:

- SWMU 27 will likely be developed for commercial land use.
- Forty-three SVOCs, pesticides, and metals were detected in surface soil samples.
- Maximum reported concentrations of arsenic, benzo(a)pyrene, beryllium, dibenzo(a,h)anthracene, and dieldrin exceeded residential soil RBCs, and concentrations reported for arsenic and dieldrin exceeded the corresponding commercial (industrial) RBCs.
- Based on a PRE performed on data from samples collected from the 0 to 1-foot bls interval:
 - Carcinogens — The *commercial* ILCR did not exceed the 10^{-4} threshold, indicating suitability for lease with no further action for commercial land use.

- Carcinogens — The *residential* ILCR was estimated to be approximately equal to the 10^{-4} threshold, and further discussion and/or investigation may be warranted to determine the suitability for lease for residential land use.

- Noncarcinogens — The *commercial* HI did not exceed 1, indicating suitability for lease with no further action for commercial land use.

- Noncarcinogens — The *residential* HI of 3 exceeded the cumulative threshold of 1, and further discussion and/or investigation may be warranted to determine the suitability for lease for a residential scenario.

Confirmatory Sampling Investigation Report
Assembly C — SWMU 27, Northside Sewage Treatment Plant
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996

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8.0 CONCLUSIONS AND RECOMMENDATIONS

During the CSI at SWMU 27, surface and subsurface soil samples were collected from nine sampling locations in the former sludge drying beds. In addition, groundwater samples were collected from the upper fluvial deposits at six of the nine sampling locations. The soil and groundwater samples were analyzed for VOCs by Hydrologic's onsite laboratory. NET's Bedford, Massachusetts, laboratory analyzed nine soil samples for Appendix IX metals and three soil samples for SVOCs and pesticides/PCBs. A PRE was developed using the data from the surface soil samples. Based on the CSI and the PRE, the following conclusions and recommendations have been reached:

- The only VOCs identified in surface and subsurface soil were isopropylbenzene and bromobenzene at Locations 3 and 6. No RBC exists for either of these compounds, which could not be distinguished by the onsite laboratory instrumentation due to similar retention times.
- No VOCs were identified in groundwater by the onsite laboratory. Three groundwater samples split and submitted to the offsite laboratory for confirmation analysis contained low concentrations of acetone, toluene, and carbon disulfide in one or more samples. Acetone is a common laboratory artifact. No RBCs for tap water or MCLs levels for drinking water were exceeded by VOCs detected in groundwater.
- Eight pesticides were detected in the three surface soil samples. The dieldrin concentration exceeded the industrial RBC and the SSL in two samples, and the residential RBC and the SSL in the third sample. However, dieldrin is ubiquitous to NSA Memphis due to its basewide aerial application during the 1950s and 1960s. Aldrin was detected above the SSL, but did not exceed its residential RBC.

- Nineteen SVOCs were detected in the three surface soil samples. Benzo(a)pyrene exceeded the industrial RBC at one location and the residential RBC at a second location. Benzo(a)anthracene exceeded both the residential RBC and the SSL at one location. Benzo(b)fluoranthene and dibenz(a,h)anthracene exceeded the residential RBC at one location, and chrysene exceeded the SSL at one location.
- Sixteen metals were detected in the surface soil samples, most of which exceeded their background RC at NSA Memphis. Arsenic exceeded its RC, industrial RBC, and SSL at two locations. Beryllium was identified at concentrations above the residential RBC in most samples; however, the background RC of beryllium exceeds the residential RBC. No other metal exceeded its residential RBC. The SSL and the background RC were exceeded for barium at two sampling locations and for mercury at one location.
- Sixteen metals were detected in the subsurface soil samples. Barium exceeded the SSL and the RC in one sample. Antimony and tin, which do not have SSLs, exceeded their RC in two subsurface soil samples each.
- The PRE results indicate the property is suitable to lease for commercial land use. Based on the results of the first phase and the anticipated commercial land use of the property, no further action is recommended for SWMU 27.

9.0 REFERENCES

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EnSafe/Allen & Hoshall (1994). *Comprehensive RFI Work Plan for Naval Air Station Memphis*. E/A&H: Memphis, Tennessee.

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Kingsbury, James A. and John K. Carmichael (1995). *Hydrogeology of Post-Wilcox Group Stratigraphic Units in the Area of the Naval Air Station Memphis, Near Millington, Tennessee*. U.S. Geological Survey Water-Resources Investigations Report 95-4011, one sheet.

United States Environmental Protection Agency (July 14, 1994). *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities*. USEPA Office of Solid Waste Emergency Response (OSWER) Directive 9355.4-12.

United States Environmental Protection Agency (1991). *Standard Operating Procedures and Quality Assurance Manual*. USEPA Region IV: Atlanta, Georgia.

United States Geological Survey (1995). Oral and written communication with Mr. Jack Carmichael. USGS: Nashville, Tennessee.

United States Environmental Protection Agency (July 14, 1994). *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities*. Office of Solid Waste Emergency Response (OSWER) Directive 9355.4-12.

Appendix A
Analytical Data

FORMAT: XXXX \ 1 2 3 4 5 6 7 8 9 0

XXXX \ - OPTIONAL project prefix
1 2 3 - SITE where sample collected
4 - MATRIX / QC code
5 6 7 8 - SAMPLING LOCATION
9 0 - DEPTH, INTERVAL, SERIAL #

All spaces MUST be filled and no extra characters included.
Use zeroes as space-fillers. Indicate MS/MSDs on COCs.

MATRIX/QC CODES:

S - soil (surface, borings, and trenches)
C - soil duplicate sample
M - sediment (settled, fluid-borne solid)
N - sediment duplicate
G - groundwater
H - groundwater duplicate sample
W - surface water
R - surface water duplicate sample
U - sludge
Y - sludge duplicate
A - air
Z - liquid waste (including IDW drums)
V - solid waste (including IDW drums)

T - trip blank
E - equipment rinse blank
D - DI system blank
P - potable water blank
F - field blank
L - filter blank
B - EPA blind spike sample
2 - cement blank
3 - drilling mud
4 - grout blank
5 - bentonite blank
6 - sand blank

DATALCP3
05/17/96

NSA MEMPHIS
NSA MEMPHIS, RFI, ASSEMBLY C
SWMU 27 - SOIL SAMPLES

Page: 1
Time: 15:23

APX9-METAL		SAMPLE ID ----->	027-S-0001-01	027-S-0001-05	027-S-0001-14	027-S-0002-01	027-S-0002-06	027-S-0002-12
		ORIGINAL ID ----->	027S000101	027S000105	027S000114	027S000201	027S000206	027S000212
		LAB SAMPLE ID ---->	1-124683S	1-124684S	1-124685S	1-124686S	1-124687S	1-124688S
		ID FROM REPORT -->	027S000101	027S000105	027S000114	027S000201	027S000206	027S000212
		SAMPLE DATE ----->	06/06/95	06/06/95	06/06/95	06/06/95	06/06/95	06/06/95
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil
		UNITS ----->	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG
CAS #	Parameter		1441 VAL	1441 VAL	1441 VAL	1441 VAL	1441 VAL	1441 VAL
SB	Antimony		19.1 J	20.4 J	12.8 UR	18.5 J	18. J	12.8 UR
AS	Arsenic		33. J	11.9 J	6.4 J	15.9 J	13.2 J	5.3 J
BA	Barium		153. J	160. J	72.9 J	109. J	191. J	73.8 J
BE	Beryllium		1.2 J	0.42 J	0.34 J	0.97 J	0.54 J	0.33 J
CD	Cadmium		1.3 J	2.6 J	2.2 J	0.7 UJ	2.4 J	1.3 J
CR	Chromium		9. J	9.4 J	6.4 J	5.5 J	10.3 J	7.4 J
CO	Cobalt		3.8 UJ	8.1 J	7.4 J	4.5 UJ	11.9 J	8. J
CU	Copper		13.5 J	17.5 J	12.7 J	14.3 J	18. J	16.1 J
PB	Lead		40.4	12.6	8.5	22.9	14.5	10.7
HG	Mercury		1.6	0.12 U	0.12 U	0.3	0.12 U	0.12 U
NI	Nickel		5.5 UJ	20.8 J	15.1 J	5.9 UJ	26.3 J	16.5 J
SE	Selenium		0.48 J	0.52 U	0.51 U	0.47 U	0.51 U	0.51 U
AG	Silver		6.6 J	0.77 UJ	0.77 UJ	2.3 UJ	0.77 UJ	0.77 UJ
TL	Thallium		0.43 UJ	0.52 UJ	0.51 UJ	0.47 UJ	0.51 UJ	0.51 UJ
V	Vanadium		9.7 J	19.9 J	14.6 J	12.7 J	22.5 J	15.6 J
ZN	Zinc		178.	54.2	39.9	69.7	60.8	51.1
SN	Tin		12.1 J	3.9 UJ	5.5 J	5.5 J	4.4 J	3.8 UJ

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DATALCP3
05/17/96

NSA MEMPHIS
NSA MEMPHIS, RFI, ASSEMBLY C
SWMU 27 - SOIL SAMPLES

Page: 2
Time: 15:23

APX9-METAL		SAMPLE ID ----->	027-S-0003-01	027-S-0003-06	027-S-0003-12	027-S-0004-01	027-S-0004-06	027-S-0004-12
		ORIGINAL ID ----->	027S000301	027S000306	027S000312	027S000401	027S000406	027S000412
		LAB SAMPLE ID ---->	8-124859S	8-124860S	8-124861S	8-124862S	8-124863S	8-124864S
		ID FROM REPORT -->	027S000301	027S000306	027S000312	027S000401	027S000406	027S000412
		SAMPLE DATE ----->	06/08/95	06/08/95	06/08/95	06/08/95	06/08/95	06/08/95
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil
		UNITS ----->	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG
CAS #	Parameter		1446 VAL	1446 VAL	1446 VAL	1446 VAL	1446 VAL	1446 VAL
SB	Antimony		11.8 UJ	12.3 UJ	12.9 UJ	13.9 UJ	12.3 UJ	12.9 UJ
AS	Arsenic		4.9	6.3	10.6	3.5 U	10.3	10.
BA	Barium		111.	197.	131.	225.	163.	100.
BE	Beryllium		0.83 J	0.61 J	0.46 J	0.68 J	0.46 J	0.41 J
CD	Cadmium		0.97 J	0.74 U	0.77 U	1.6	0.74 U	0.78 U
CR	Chromium		8.6	14.3	13.8	17.	11.6	10.8
CO	Cobalt		3.2 J	11.7 J	7.2 J	5.8 J	10. J	8.7 J
CU	Copper		17.6	10.	12.4	38.4	11.7	12.9
PB	Lead		40.9	7.7	11.9	60.5	11.6	11.7
HG	Mercury		1.2	0.12 U	0.12 U	1.7	0.12 U	0.12 U
NI	Nickel		9.1 J	22.7	24.	11. J	28.1	20.1
SE	Selenium		0.76 UR	0.7 UR	0.73 UR	0.71 UR	0.63 UR	0.75 UR
AG	Silver		1.2 UR	1.2 UR	1.3 UR	8.4 J	1.2 UR	1.3 UR
TL	Thallium		0.47 UJ	0.49 UJ	0.51 UJ	0.56 UJ	0.49 UJ	0.52 UJ
V	Vanadium		11.1	20.8	24.6	17.7	18.8	17.3
ZN	Zinc		155.	47.1	57.	239.	54.5	53.1
SN	Tin		16.6 U	4.2 U	7.1 U	22.1 J	3.7 U	6.8 U

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DATALCP3
05/17/96

NSA MEMPHIS
NSA MEMPHIS, RFI, ASSEMBLY C
SWMU 27 - SOIL SAMPLES

Page: 3
Time: 15:23

APX9-METAL		SAMPLE ID ----->	027-S-0005-01	027-S-0005-06	027-S-0005-12	027-C-0005-12	027-S-0006-01	027-S-0006-06
		ORIGINAL ID ----->	027S000501	027S000506	027S000512	027C000512	027S000601	027S000606
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		ID FROM REPORT -->	027S000501	027S000506	027S000512	027C000512	027S000601	027S000606
		SAMPLE DATE ----->	06/08/95	06/08/95	06/08/95	06/08/95	06/08/95	06/08/95
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil
		UNITS ----->	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG
CAS #	Parameter		1446 VAL	1446 VAL	1446 VAL	1446 VAL	1446 VAL	1446 VAL
SB	Antimony		12.1 UJ	12.3 UJ	12.5 UJ	12.4 UJ	12.8 UJ	12.1 UJ
AS	Arsenic		9.4	5.6	5.1	7.7	7.7	8.9
BA	Barium		202.	121.	115.	131.	120.	294.
BE	Beryllium		0.45 J	0.34 J	0.4 J	0.57 J	0.65 J	0.59 J
CD	Cadmium		0.82 J	0.74 U	0.75 U	0.75 U	0.77 U	0.72 U
CR	Chromium		11.2	9.9	15.	17.3	16.4	16.7
CO	Cobalt		8. J	6.1 J	5.1 J	7.2 J	6.6 J	8.7 J
CU	Copper		23.5	7.1	7.9	8.9	11.	13.1
PB	Lead		43.7	7.	7.8	11.9	30.6	9.4
HG	Mercury		0.75	0.12 U	0.12 U	0.12 U	0.25	0.11 U
NI	Nickel		18.7	14.9	14.9	16.6	14.9	33.1
SE	Selenium		0.58 UR	0.52 UR	1.1 UR	0.71 UR	0.86 UR	0.54 UR
AG	Silver		2.3 J	1.2 UR	1.2 UR	1.2 UR	1.3 UR	1.2 UR
TL	Thallium		0.48 UJ	0.49 UJ	0.5 UJ	0.87 UJ	0.51 UJ	0.48 UJ
V	Vanadium		15.4	14.4	17.5	25.1	19.1	30.
ZN	Zinc		138.	39.5	45.9	56.9	86.8	73.4
SN	Tin		11.3 U	4.8 U	3.7 U	3.7 U	6.4 U	6.4 U

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DATALCP3
05/17/96

NSA MEMPHIS
NSA MEMPHIS, RFI, ASSEMBLY C
SWMU 27 - SOIL SAMPLES

Page: 4
Time: 15:23

APX9-METAL		SAMPLE ID -----> ORIGINAL ID -----> LAB SAMPLE ID ----> ID FROM REPORT --> SAMPLE DATE -----> MATRIX -----> UNITS ----->	027-S-0006-12 027S000612 8-124870S 027S000612 06/08/95 Soil MG/KG	027-S-0007-01 027S000701 8-124871S 027S000701 06/08/95 Soil MG/KG	027-S-0007-06 027S000706 8-124872S 027S000706 06/08/95 Soil MG/KG	027-S-0007-12 027S000712 8-124873S 027S000712 06/08/95 Soil MG/KG	027-S-0008-01 027S000801 8-124874S 027S000801 06/08/95 Soil MG/KG	027-S-0008-06 027S000806 8-124875S 027S000806 06/08/95 Soil MG/KG
CAS #	Parameter	1446 VAL	1446 VAL	1446 VAL	1446 VAL	1446 VAL	1446 VAL	1446 VAL
SB	Antimony	12.6 UJ	10.7 UJ	12. UJ	11.9 UJ	11.3 UJ	12.3 UJ	
AS	Arsenic	5.1	4.	7.	8.7	10.6	14.2	
BA	Barium	110.	148.	167.	151.	110.	138.	
BE	Beryllium	0.39 J	0.21 U	0.46 J	0.38 J	0.41 J	0.44 J	
CD	Cadmium	0.76 U	0.97 J	0.72 U	0.72 U	0.68 U	0.74 U	
CR	Chromium	13.4	6.7	15.	13.5	12.8	10.2	
CO	Cobalt	4.2 J	1.3 U	7. J	7.6 J	7.9 J	9.3 J	
CU	Copper	8.6	38.3	7.7	7.4	8.8	11.8	
PB	Lead	6.1	277.	7.8	10.6	24.7	14.5	
HG	Mercury	0.12 U	3.1	0.11 U	0.11	0.13	0.12 U	
NI	Nickel	14.4	5.3 U	19.6	19.4	14.8	21.8	
SE	Selenium	0.71 UR	0.43 UR	0.48 UR	0.48 UR	0.45 UR	0.49 UR	
AG	Silver	1.3 UR	15.8 J	1.2 UR	1.2 UR	1.1 UR	1.2 UR	
TL	Thallium	0.5 UJ	0.43 UJ	0.48 UJ	0.48 UJ	0.45 UJ	0.49 UJ	
V	Vanadium	12.9	2.8 J	23.5	19.8	18.3	17.2	
ZN	Zinc	55.5	163.	45.4	58.5	49.1	89.2 J	
SN	Tin	3.8 U	19.9 U	4. U	6. U	4.1 U	7.7 U	

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DATALCP3
05/17/96

NSA MEMPHIS
NSA MEMPHIS, RFI, ASSEMBLY C
SWMU 27 - SOIL SAMPLES

Page: 5
Time: 15:23

APX9-METAL		SAMPLE ID ----->	027-C-0008-06	027-S-0008-12	027-C-0008-12	027-S-0009-01	027-S-0009-06	027-S-0009-12
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		ID FROM REPORT -->	027C000806	027S000812	027C000812	027S000901	027S000906	027S000912
		SAMPLE DATE ----->	06/08/95	06/08/95	06/08/95	06/08/95	06/08/95	06/08/95
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil
		UNITS ----->	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG
CAS #	Parameter		1446 VAL	1447 VAL	1447 VAL	1447 VAL	1447 VAL	1447 VAL
SB	Antimony		12.1 UJ	12.5 UJ	12.6 UJ	12.3 UJ	12.8 UJ	13. UJ
AS	Arsenic		7.9	9.2	7.8	11.2	13.7	7.9
BA	Barium		113.	77.8	68.6	52.7	134.	60.1
BE	Beryllium		0.38 J	0.3 J	0.3 J	0.33 J	0.47 J	0.28 J
CD	Cadmium		0.73 U	0.99 J	1.3 J	1.1 J	1.9 J	0.78 UJ
CR	Chromium		11.7	6.7 J	8.	9.7	10.	4.9 J
CO	Cobalt		7. J	6.5 J	6.4 J	5.4 J	7.1 J	5.7 J
CU	Copper		9.4	12.9	13.4	11.3	18.1	13.2
PB	Lead		9.6	9.4	6.8	10.2	13.	9.
HG	Mercury		0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
NI	Nickel		18.3	23.2	18.5	10.2	26.6	17.5
SE	Selenium		0.75 UR	0.53 J	0.51 UJ	0.5 J	0.51 UJ	0.53 J
AG	Silver		1.2 UR	0.77 U	0.83 J	0.74 U	0.76 U	0.97 J
TL	Thallium		0.48 UJ	0.5 UJ	0.51 UJ	0.49 UJ	0.51 UJ	0.5 UJ
V	Vanadium		17.1	12.5 J	13.2	26.1	18.9	13.1
ZN	Zinc		44.6 J	40.	42.8	31.6	59.	38.
SN	Tin		4.8 U	5.2 U	3.8 U	3.7 U	4.3 U	7.7 U

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DATALCP3
05/17/96

NSA MEMPHIS
NSA MEMPHIS, RFI, ASSEMBLY C
SWMU 27 - SOIL SAMPLES

Page: 6
Time: 15:23

SUB46-PEST		SAMPLE ID ----->	027-S-0001-01	027-S-0002-01	027-S-0005-01			
		ORIGINAL ID ----->	027SSB1001	027SSB1101	027SSB1201			
		LAB SAMPLE ID ---->	143759	143760	143761			
		ID FROM REPORT -->	027SSB1001	027SSB1101	027SSB1201			
		SAMPLE DATE ----->	03/06/96	03/06/96	03/06/96			
		DATE EXTRACTED -->	03/14/96	03/14/96	03/14/96			
		DATE ANALYZED ---->	03/16/96	03/16/96	03/18/96			
		MATRIX ----->	Soil	Soil	Soil			
		UNITS ----->	UG/KG	UG/KG	UG/KG			
CAS #	Parameter	1717	VAL	1717	VAL	1717	VAL	
309-00-2	Aldrin	2.1	U	9.7	J	2.	U	
58-89-9	gamma-BHC (Lindane)	2.1	U	2.	U	2.	U	
319-84-6	alpha-BHC	2.1	U	2.	U	2.	U	
319-85-7	beta-BHC	2.1	U	2.	U	2.	U	
319-86-8	delta-BHC	2.1	U	2.	U	2.	U	
57-74-9	Chlordane	NR		NR		NR		
72-54-8	4,4'-DDD	4.2	U	4.	U	2.6	J	
72-55-9	4,4'-DDE	4.2	UJ	4.	UJ	4.1	UJ	
50-29-3	4,4'-DDT	7.1	J	19.	J	14.	J	
60-57-1	Dieldrin	200.	D	1200.	D	710.	D	
959-98-8	Endosulfan I	2.1	U	2.	U	2.	U	
33213-65-9	Endosulfan II	4.2	U	4.	U	4.1	U	
1031-07-8	Endosulfan sulfate	4.2	U	4.	U	4.1	U	
72-20-8	Endrin	4.2	U	8.1	J	4.5		
7421-93-4	Endrin aldehyde	4.2	U	4.	U	4.1	U	
76-44-8	Heptachlor	2.1	U	2.	U	2.	U	
1024-57-3	Heptachlor epoxide	3.2	J	19.		6.	J	
72-43-5	Methoxychlor	21.	U	20.	U	20.	U	
8001-35-2	Toxaphene	42.	U	40.	U	41.	U	
12674-11-2	Aroclor-1016	42.	U	40.	U	41.	U	
11104-28-2	Aroclor-1221	42.	U	40.	U	41.	U	
11141-16-5	Aroclor-1232	42.	U	40.	U	41.	U	
53469-21-9	Aroclor-1242	42.	U	40.	U	41.	U	
12672-29-6	Aroclor-1248	42.	U	40.	U	41.	U	
11097-69-1	Aroclor-1254	42.	U	40.	U	41.	U	
11096-82-5	Aroclor-1260	42.	U	40.	U	41.	U	
53494-70-5	Endrin ketone	4.2	U	4.	U	4.1	U	
5103-71-9	alpha-Chlordane	19.		120.	D	2.	U	
5103-74-2	gamma-Chlordane	8.1		200.	UD	2.	U	
1114-16-5		NR		NR		NR		
12789-03-6	Technical Chlordane	110.		670.		41.	U	

*** Validation Complete ***

DATALCP3
05/17/96

NSA MEMPHIS
NSA MEMPHIS, RFI, ASSEMBLY C
SWMU 27 - SOIL SAMPLES

Page: 7
Time: 15:23

SW846-SVOA		SAMPLE ID ----->	027-S-0001-01	027-S-0002-01	027-S-0005-01			
		ORIGINAL ID ----->	027SSB1001	027SSB1101	027SSB1201			
		LAB SAMPLE ID ---->	143759	143760	143761			
		ID FROM REPORT -->	027SSB1001	027SSB1101	027SSB1201			
		SAMPLE DATE ----->	03/06/96	03/06/96	03/06/96			
		DATE EXTRACTED -->	03/11/96	03/11/96	03/11/96			
		DATE ANALYZED ---->	03/12/96	03/12/96	03/12/96			
		MATRIX ----->	Soil	Soil	Soil			
		UNITS ----->	ug/Kg	ug/Kg	ug/Kg			
CAS #	Parameter	1717	VAL	1717	VAL	1717	VAL	
108-95-2	Phenol	420.	U	400.	U	410.	U	
111-44-4	bis(2-Chloroethyl)ether	420.	U	400.	U	410.	U	
95-57-8	2-Chlorophenol	420.	U	400.	U	410.	U	
541-73-1	1,3-Dichlorobenzene	420.	U	400.	U	410.	U	
106-46-7	1,4-Dichlorobenzene	420.	U	400.	U	410.	U	
95-50-1	1,2-Dichlorobenzene	420.	U	400.	U	410.	U	
95-48-7	2-Methylphenol (o-Cresol)	420.	U	400.	U	410.	U	
108-60-1	2,2'-oxybis(1-Chloropropane)	420.	U	400.	U	410.	U	
106-44-5	4-Methylphenol (p-Cresol)	420.	U	400.	U	410.	U	
621-64-7	N-Nitroso-di-n-propylamine	420.	U	400.	U	410.	U	
67-72-1	Hexachloroethane	420.	U	400.	U	410.	U	
98-95-3	Nitrobenzene	420.	U	400.	U	410.	U	
78-59-1	Isophorone	420.	U	400.	U	410.	U	
88-75-5	2-Nitrophenol	420.	U	400.	U	410.	U	
105-67-9	2,4-Dimethylphenol	420.	U	400.	U	410.	U	
120-83-2	2,4-Dichlorophenol	420.	U	400.	U	410.	U	
120-82-1	1,2,4-Trichlorobenzene	420.	U	400.	U	410.	U	
91-20-3	Naphthalene	420.	U	250.	J	410.	U	
106-47-8	4-Chloroaniline	420.	U	400.	U	410.	U	
87-68-3	Hexachlorobutadiene	420.	U	400.	U	410.	U	
111-91-1	bis(2-Chloroethoxy)methane	420.	U	400.	U	410.	U	
59-50-7	4-Chloro-3-methylphenol	420.	U	400.	U	410.	U	
91-57-6	2-Methylnaphthalene	420.	U	63.	J	410.	U	
77-47-4	Hexachlorocyclopentadiene	420.	U	400.	U	410.	U	
88-06-2	2,4,6-Trichlorophenol	420.	U	400.	U	410.	U	
95-95-4	2,4,5-Trichlorophenol	1000.	U	1000.	U	1000.	U	
91-58-7	2-Chloronaphthalene	420.	U	400.	U	410.	U	
88-74-4	2-Nitroaniline	1000.	U	1000.	U	1000.	U	
131-11-3	Dimethyl phthalate	420.	U	400.	U	410.	U	
208-96-8	Acenaphthylene	420.	U	43.	J	45.	J	
606-20-2	2,6-Dinitrotoluene	420.	U	400.	U	410.	U	
99-09-2	3-Nitroaniline	1000.	U	1000.	U	1000.	U	
83-32-9	Acenaphthene	420.	U	300.	J	410.	U	
51-28-5	2,4-Dinitrophenol	1000.	U	1000.	U	1000.	U	
100-02-7	4-Nitrophenol	1000.	U	1000.	U	1000.	U	
132-64-9	Dibenzofuran	420.	U	240.	J	410.	U	

*** Validation Complete ***

DATALCP3
05/17/96

NSA MEMPHIS
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SWMU 27 - SOIL SAMPLES

Page: 8
Time: 15:23

SW846-SVOA		SAMPLE ID ----->	027-S-0001-01	027-S-0002-01	027-S-0005-01			
		ORIGINAL ID ----->	027SSB1001	027SSB1101	027SSB1201			
		LAB SAMPLE ID ---->	143759	143760	143761			
		ID FROM REPORT -->	027SSB1001	027SSB1101	027SSB1201			
		SAMPLE DATE ----->	03/06/96	03/06/96	03/06/96			
		DATE EXTRACTED -->	03/11/96	03/11/96	03/11/96			
		DATE ANALYZED ---->	03/12/96	03/12/96	03/12/96			
		MATRIX ----->	Soil	Soil	Soil			
		UNITS ----->	ug/Kg	ug/Kg	ug/Kg			
CAS #	Parameter	1717	VAL	1717	VAL	1717	VAL	
121-14-2	2,4-Dinitrotoluene	420.	U	400.	U	410.	U	
84-66-2	Diethylphthalate	420.	U	400.	U	410.	U	
7005-72-3	4-Chlorophenylphenylether	420.	U	400.	U	410.	U	
86-73-7	Fluorene	420.	U	380.	J	410.	U	
100-01-6	4-Nitroaniline	1000.	U	1000.	U	1000.	U	
534-52-1	2-Methyl-4,6-Dinitrophenol	1000.	U	1000.	U	1000.	U	
86-30-6	N-Nitrosodiphenylamine	420.	U	400.	U	410.	U	
101-55-3	4-Bromophenyl-phenylether	420.	U	400.	U	410.	U	
118-74-1	Hexachlorobenzene	420.	U	400.	U	410.	U	
87-86-5	Pentachlorophenol	1000.	U	1000.	U	1000.	U	
85-01-8	Phenanthrene	420.	U	3000.		360.	J	
120-12-7	Anthracene	420.	U	640.		94.	J	
86-74-8	Carbazole	420.	U	600.		40.	J	
84-74-2	Di-n-butylphthalate	420.	U	400.	U	410.	U	
206-44-0	Fluoranthene	79.	J	2900.		630.		
129-00-0	Pyrene	79.	J	2400.		560.		
85-68-7	Butylbenzylphthalate	420.	U	400.	U	410.	U	
91-94-1	3,3'-Dichlorobenzidine	420.	U	400.	U	410.	U	
56-55-3	Benzo(a)anthracene	41.	J	1400.		320.	J	
218-01-9	Chrysene	50.	J	1300.		310.	J	
117-81-7	bis(2-Ethylhexyl)phthalate (BEHP)	420.	U	400.	U	410.	U	
117-84-0	Di-n-octyl phthalate	420.	U	400.	U	410.	U	
205-99-2	Benzo(b)fluoranthene	50.	J	1200.		330.	J	
207-08-9	Benzo(k)fluoranthene	50.	J	890.		280.	J	
50-32-8	Benzo(a)pyrene	51.	J	1100.		290.	J	
193-39-5	Indeno(1,2,3-cd)pyrene	420.	U	520.		140.	J	
53-70-3	Dibenz(a,h)anthracene	420.	U	230.	J	43.	J	
191-24-2	Benzo(g,h,i)perylene	41.	J	530.		160.	J	

*** Validation Complete ***

DATALCP3
05/17/96

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SWMU 27 - SOIL SAMPLES

Page: 9
Time: 15:23

SWB46-VDA		SAMPLE ID -----> ORIGINAL ID -----> LAB SAMPLE ID ----> ID FROM REPORT --> SAMPLE DATE -----> DATE ANALYZED ----> MATRIX -----> UNITS ----->		027-C-0005-12 027C000512 124857 027C000512 06/08/95 06/12/95 Soil UG/KG	027-C-0008-06 027C000806 124858 027C000806 06/08/95 06/13/95 Soil UG/KG	027-C-0008-12 027C000812 124877 027C000812 06/08/95 06/12/95 Soil UG/KG				
CAS #	Parameter	1446	VAL	1446	VAL	1447	VAL			
74-87-3	Chloromethane	12.	U	12.	UJ	12.	U			
74-83-9	Bromomethane	12.	U	12.	UJ	12.	U			
75-01-4	Vinyl chloride	12.	U	12.	UJ	12.	U			
75-00-3	Chloroethane	12.	U	12.	UJ	12.	U			
75-09-2	Methylene chloride	2.	J	12.	UJ	12.	U			
67-64-1	Acetone	12.	U	12.	UJ	12.	U			
75-15-0	Carbon disulfide	12.	U	12.	UJ	12.	U			
75-35-4	1,1-Dichloroethene	12.	U	12.	UJ	12.	U			
75-34-3	1,1-Dichloroethane	12.	U	12.	UJ	12.	U			
540-59-0	1,2-Dichloroethene (total)	12.	U	12.	UJ	12.	UJ			
67-66-3	Chloroform	12.	U	12.	UJ	12.	U			
107-06-2	1,2-Dichloroethane	12.	U	12.	UJ	12.	U			
78-93-3	2-Butanone (MEK)	12.	U	12.	UJ	12.	U			
71-55-6	1,1,1-Trichloroethane	12.	UJ	12.	UJ	12.	U			
56-23-5	Carbon tetrachloride	12.	UJ	12.	UJ	12.	U			
75-27-4	Bromodichloromethane	12.	UJ	12.	UJ	12.	U			
78-87-5	1,2-Dichloropropane	12.	UJ	12.	UJ	12.	U			
10061-01-5	cis-1,3-Dichloropropene	12.	UJ	12.	UJ	12.	U			
79-01-6	Trichloroethene	12.	UJ	12.	UJ	12.	U			
124-48-1	Dibromochloromethane	12.	UJ	12.	UJ	12.	U			
79-00-5	1,1,2-Trichloroethane	12.	UJ	12.	UJ	12.	U			
71-43-2	Benzene	12.	UJ	12.	UJ	12.	U			
10061-02-6	trans-1,3-Dichloropropene	12.	UJ	12.	UJ	12.	U			
75-25-2	Bromoform	12.	UJ	12.	UJ	12.	U			
108-10-1	4-Methyl-2-Pentanone (MIBK)	12.	UJ	12.	UJ	12.	U			
591-78-6	2-Hexanone	12.	UJ	12.	UJ	12.	U			
127-18-4	Tetrachloroethene	12.	UJ	12.	UJ	12.	U			
79-34-5	1,1,2,2-Tetrachloroethane	12.	UJ	12.	UJ	12.	U			
108-88-3	Toluene	12.	UJ	12.	UJ	12.	U			
108-90-7	Chlorobenzene	12.	UJ	12.	UJ	12.	U			
100-41-4	Ethylbenzene	12.	UJ	12.	UJ	12.	U			
100-42-5	Styrene	12.	UJ	12.	UJ	12.	U			
1330-20-7	Xylene (Total)	12.	UJ	12.	UJ	12.	U			

*** Validation Complete ***

HydroLogic Mobile Laboratory
Analytical Data - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location:027S000101
Lab File ID:NAS195.001
Calibration Std.:vc0606.001

Date: 06/06/95
Blank: blk0606.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	54.2	34.9	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	18	10
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Data - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location: 027S000105
Lab File ID: NAS191.001
Calibration Std.: vc0606.001

Date: 06/06/95
Blank: blk0606.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	81.1	64.2	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	11	10
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
 Analytical Data - Volatile Organic Compounds
 Memphis Naval Air Station

Sample Location: 027S000114
 Lab File ID: NAS196.001
 Calibration Std.: vc0606.001

Date: 06/06/95
 Blank: blk0606.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	76.9	62.8	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	11.0	10
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Data - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location:027G000144
Lab File ID:NAS190A.001
Calibration Std.:vc0607.001

Date: 06/07/95
Blank: blk0607.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	91.1	87.6	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	BDL	10
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Data - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location:027S000201
Lab File ID:NAS194.001
Calibration Std.:vc0606.001

Date: 06/06/95
Blank: blk0606.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	61.6	41.1	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	15	10
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
 Analytical Data - Volatile Organic Compounds
 Memphis Naval Air Station

Sample Location: 027S000206
 Lab File ID: NAS192.001
 Calibration Std.: vc0606.001

Date: 06/06/95
 Blank: blk0606.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	75.5	64.8	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	11	10
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Data - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location:027S000212
Lab File ID:NAS193.001
Calibration Std.:vc0606.001

Date: 06/06/95
Blank: blk0606.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	79.3	65.3	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	10-	10
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
 Analytical Data - Volatile Organic Compounds
 Memphis Naval Air Station

Sample Location: 027G000244

Date: 06/07/95

Dilution:

1

Lab File ID: NAS197.WKS

Blank: bik0607.001

Calibration Std.: vc0607.001

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	93.8	92.5	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	BDL	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Data - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location: 027G000244
Lab File ID: NAS197.WKS
Calibration Std.: vc0607.001

Date: 06/07/95
Blank: blk0607.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	93.8	92.5	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	BDL	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Data - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location: 027S000301
Lab File ID: NAS197.WKS
Calibration Std.: vc0607.001

Date: 06/07/95
Blank: bik0607.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	57.8	40.6	
40,42	5.8	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	17	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
 Analytical Data - Volatile Organic Compounds
 Memphis Naval Air Station

Sample Location: 027S000306

Date: 06/07/95

Dilution:

1

Lab File ID: NAS206.001

Blank: blk0607.001

Calibration Std.: vc0607.001

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	71.7	60.5	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	11-	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
 Analytical Data - Volatile Organic Compounds
 Memphis Naval Air Station

Sample Location:027S000312

Date: 06/07/95

Dilution:

1

Lab File ID:NAS199.001

Blank: blk0607.001

Calibration Std.:vc0607.001

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	70.4	73.3	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	11	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
 Analytical Data - Volatile Organic Compounds
 Memphis Naval Air Station

Sample Location: 027S000401

Date: 06/07/95

Dilution:

1

Lab File ID: NAS207.001

Blank: blk0607.001

Calibration Std.: vc0607.001

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	60.6	44.9	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	15	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Data - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location:027S000406
Lab File ID:NAS203.001
Calibration Std.:vc0607.001

Date: 06/07/95
Blank: blk0607.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	76	69.7	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	11	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
 Analytical Data - Volatile Organic Compounds
 Memphis Naval Air Station

Sample Location: 027S000412
 Lab File ID: NAS208.001
 Calibration Std.: vc0607.001

Date: 06/07/95
 Blank: blk0607.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	70.8	64.9	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	11	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Data - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location: 027S000501
Lab File ID: NAS204.001
Calibration Std.: vc0607.001

Date: 06/07/95
Blank: blk0607.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	69.1	60.5	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	BDL	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Data - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location: 027S000506
Lab File ID: NAS201.001
Calibration Std.: vc0607.001

Date: 06/07/95
Blank: blk0607.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	80.2	75.7	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenec chloride	n/a	11	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
 Analytical Data - Volatile Organic Compounds
 Memphis Naval Air Station

Sample Location: 027S000512
 Lab File ID: NAS202.001
 Calibration Std.: vc0607.001

Date: 06/07/95
 Blank: blk0607.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	78.3	75.3	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methyleneschloride	n/a	11	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Data - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location:027G000545
Lab File ID:NAS198.001
Calibration Std.:vc0607.001

Date: 06/07/95
Blank: blk0607.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	82.7	84.5	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	BDL	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
 Analytical Data - Volatile Organic Compounds
 Memphis Naval Air Station

Sample Location: 027S000601
 Lab File ID: NAS210.001
 Calibration Std.: vc0607.001

Date: 06/07/95
 Blank: blk0607.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	51.1	34.1	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	16	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Data - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location: 027S000608
Lab File ID: NAS211.001
Calibration Std.: vc0607.001

Date: 06/07/95
Blank: blk0607.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	66.4	58.1	
40,42	41.1	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	11	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Data - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location: 027S000612
Lab File ID: NAS209A.001
Calibration Std.: vc0608.001

Date: 06/08/95
Blank: blk0608.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Halt (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	81.1	72.8	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	BDL	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Data - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location: 027G000644
Lab File ID: NAS200.001
Calibration Std.: vc0607.001

Date: 06/07/95
Blank: blk0607.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	81.5	86.9	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	BQL	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Data - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location: 027S000701
Lab File ID: NAS212.001
Calibration Std.: vc0607.001

Date: 06/07/95
Blank: bik0607.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	65.5	57	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	14	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Data - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location:027S000706
Lab File ID:NAS213A.001
Calibration Std.:vc0608.001

Date: 06/08/95
Blank: blk0608.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	93.7	79.8	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	13	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
 Analytical Data - Volatile Organic Compounds
 Memphis Naval Air Station

Sample Location: 027S000712
 Lab File ID: NAS214.001
 Calibration Std.: vc0608.001

Date: 06/08/95
 Blank: blk0608.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	65.1	43.4	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	13	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
 Analytical Data - Volatile Organic Compounds
 Memphis Naval Air Station

Sample Location: 027S000801
 Lab File ID: NAS217.001
 Calibration Std.: vc0608.001

Date: 06/08/95
 Blank: blk0608.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	69	51.8	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	17	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Data - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location:027S000806
Lab File ID:NAS216.001
Calibration Std.:vc0608.001

Date: 06/08/95
Blank: blk0608.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	80.2	63.7	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	12	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
 Analytical Data - Volatile Organic Compounds
 Memphis Naval Air Station

Sample Location: 027S000812
 Lab File ID: NAS215.001
 Calibration Std.: vc0608.001

Date: 06/08/95
 Blank: bik0608.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	89.1	79.8	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	BDL	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Data - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location:027G000844
Lab File ID:NAS222.001
Calibration Std.:vc0608.001

Date: 06/08/95
Blank: blk0608.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	95.2	98.7	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	BDL	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Data - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location: 027S000901
Lab File ID: NAS218.001
Calibration Std.: vc0608.001

Date: 06/08/95
Blank: blk0608.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	77.4	66.6	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	15.	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Data - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location: 027S000906
Lab File ID: NAS219A.001
Calibration Std.: vc0608.001

Date: 06/08/95
Blank: blk0608.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	78.1	66.7	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	14	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Data - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location: 027S000912
Lab File ID: NAS220.001
Calibration Std.: vc0608.001

Date: 06/08/95
Blank: blk0608.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. FID (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	90.9	105	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	9	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Data - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location: 027G000944
Lab File ID: NAS221.001
Calibration Std.: vc0608.001

Date: 06/08/95
Blank: blk0608.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	97.6	97.4	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	BDL	11
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

**ASSEMBLY C CSI REPORT
NAVAL SUPPORT ACTIVITY MEMPHIS
MILLINGTON, TENNESSEE**

**RCRA FACILITY INVESTIGATION
SWMU 62 — M-21 ARRESTING GEAR**



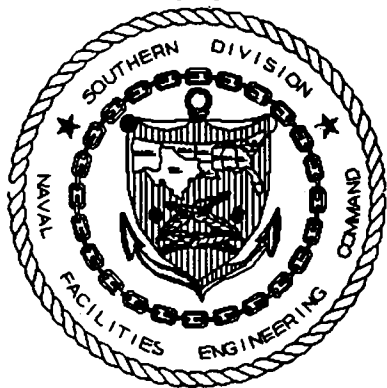
REVISION 2

CTO-094

Contract No: N62467-89-D-0318

Prepared for:

**Department of the Navy
Southern Division
Naval Facilities Engineering Command
North Charleston, South Carolina**



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September 25, 1996

Table of Contents

EXECUTIVE SUMMARY	iv
1.0 INTRODUCTION	1-1
2.0 SITE DESCRIPTION AND HISTORICAL INFORMATION	2-1
2.1 Site Description	2-1
2.2 Historical Site Operations	2-1
3.0 PREVIOUS INVESTIGATIONS	3-1
4.0 FIELD INVESTIGATION AND METHODS	4-1
4.1 Subsurface and Surface Soil Investigation	4-3
4.1.1 Surface Soil Investigation	4-3
4.1.2 DPT Subsurface Soil Investigation	4-7
4.2 DPT Groundwater Investigation	4-9
4.3 Sampling Protocol	4-10
4.3.1 QA/QC Samples	4-10
4.3.2 Sample Processing and Chain-of-Custody Procedure	4-11
4.3.3 Sample Labeling	4-11
4.4 Grouting Procedures	4-12
4.5 Decontamination Procedures	4-12
5.0 GEOLOGY AND HYDROGEOLOGY	5-1
5.1 Regional Geology and Hydrogeology	5-1
5.2 Site-Specific Geology and Hydrogeology	5-2
5.2.1 USGS Stratigraphic Test Boring	5-3
5.2.2 Previous Investigations	5-4
5.2.3 DPT Piezocone Soundings	5-4
5.2.4 DPT Hydrocone Plots	5-5
6.0 NATURE AND EXTENT OF CONTAMINATION	6-1
6.1 Background Reference Concentrations	6-2
6.2 Soil Sample Analytical Results	6-2
6.2.1 Surface Soil Samples	6-2
6.2.2 Subsurface Soil Samples	6-7
6.3 Groundwater Samples	6-8
6.4 Summary of Nature and Extent	6-9
7.0 PRELIMINARY RISK EVALUATION	7-1
8.0 CONCLUSIONS AND RECOMMENDATIONS	8-1
9.0 REFERENCES	9-1

List of Figures

Figure 1-1	Vicinity Map	1-3
Figure 1-2	Digital Orthophotograph	1-5
Figure 2-1	Site Map	2-3
Figure 4-1	Sample Locations	4-5
Figure 6-1	Background Sample Locations	6-3
Figure 6-2	Surface Soil Contaminants Summary	6-11
Figure 6-3	Groundwater Contaminants Summary	6-13
Figure 6-4	Transfer from Soil to Groundwater SSL Exceedances	6-15

List of Tables

Table 6-1	Detected Concentrations of Metals, Pesticides, and SVOCs in Surface Soil	6-5
Table 6-2	Detected Concentrations of VOCs in Subsurface Soil	6-8
Table 6-3	Detected Concentrations of VOCs in Groundwater	6-8
Table 7-1	PRE for Residential and Commercial Carcinogens	7-3
Table 7-2	PRE for Residential and Commercial Non-Carcinogens	7-4

List of Appendices

Appendix A	DPT Piezocone and Hydrocone Plots
Appendix B	Analytical Data

LIST OF ACRONYMS AND ABBREVIATIONS

BRAC	Base Realignment and Closure
bls	below land surface
CSI	Confirmatory Sampling Investigation
DPT	direct push technology
DQOs	Data Quality Objectives
E/A&H	EnSafe/Allen & Hoshall
HI	hazard index
ILCR	Incremental Lifetime Excess Cancer Risk
IM	Interim Measures
MCL	maximum contaminant level
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
ND	not detected
NET	National Environmental Testing, Incorporated
NSA	Naval Support Activity (formerly Naval Air Station)
PCBs	polychlorinated biphenyls
PRE	Preliminary Risk Evaluation
RBC	risk-based concentration
RC	reference concentration
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RR	risk ratio
SOUTHNAVFACENGCOM	Southern Division Naval Facilities Engineering Command
SVOC	semivolatile organic compound
SWMU	solid waste management unit
SST	Subsurface Technologies, Inc.
THQ	target hazard quotient
TR	target risk
USEPA	United States Environmental Protection Agency
USGS	U.S. Geological Survey
UST	underground storage tank
VOC	volatile organic compound

EXECUTIVE SUMMARY

The *Assembly C Site Investigation Plans* for Naval Support Activity Memphis proposed two phases of investigation for a Confirmatory Sampling Investigation (CSI) at Solid Waste Management Unit (SWMU) 62, the M-21 Arresting Gear. The first phase consisted of a soil and groundwater investigation using Direct Push Technology (DPT) equipment. Based on the results of the first phase, the second phase, consisting of installing and sampling soil borings and monitoring wells, is not required. This report summarizes the activities conducted during the CSI's first phase and the resulting findings and conclusions.

During the first phase of the CSI, 12 subsurface soil samples collected from two intervals at six locations were analyzed for volatile organic compounds (VOCs). No detected concentration of any VOC in subsurface soil exceeded its U.S. Environmental Protection Agency (USEPA) soil screening level. Fluvial deposits groundwater samples collected from four locations were analyzed for VOCs. No VOC in groundwater exceeded its USEPA risk-based concentration (RBC) for tap water or its maximum contaminant level for drinking water.

To finalize the Resource Conservation and Recovery Act closure of the SWMU, three surface soil samples were collected and analyzed for semivolatile organic compounds (SVOCs), pesticides/polychlorinated biphenyls (PCBs), and Appendix IX metals. No SVOCs or PCBs were detected in the soil samples. No detected concentration of any pesticide exceeded its residential RBC. No detected concentration of any metal exceeded both its residential RBC and its background reference concentration (two times the mean background concentration). The surface soil sample results were used to prepare a Preliminary Risk Evaluation (PRE). The PRE indicates the property is suitable for lease for either residential or commercial land use.

Based on the results of the first phase and the PRE, no further action is recommended for SWMU 62.

1.0 INTRODUCTION

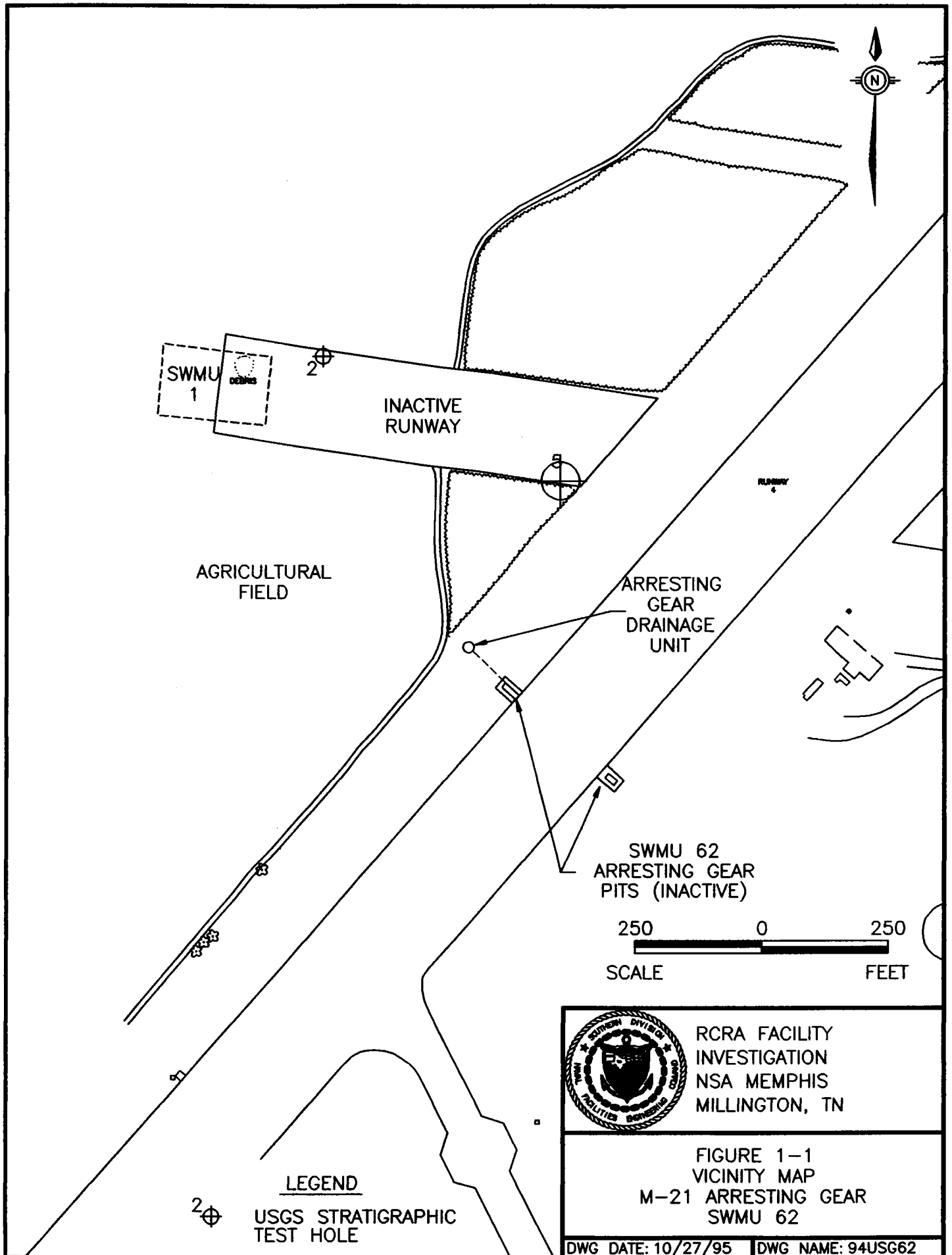
As part of the U.S. Navy Installation Restoration Program, the following Confirmatory Sampling Investigation (CSI) report has been prepared for Solid Waste Management Unit (SWMU) 62, the M-21 Arresting Gear, on the Northside of Naval Support Activity (NSA) Memphis in Millington, Tennessee. Figures 1-1 and 1-2 provide a vicinity map and aerial photograph of SWMU 62, respectively.

As a result of the Base Closure and Realignment Act of 1990 (BRAC), a portion of NSA Memphis, which includes SWMU 62, will be closed and prepared for transfer to the City of Millington. Eight SWMU assemblies (i.e., groups) have been defined for the NSA Memphis Resource Conservation and Recovery Act (RCRA) Corrective Action Program. Four of these assemblies (A, B, C, and D) are on closing portions of the base and have been categorized and ranked according to their BRAC status. SWMU 62 is in Assembly C, which is composed of five SWMUs requiring CSIs to confirm whether a release of contaminants has occurred and, if so, whether RCRA Facility Investigation (RFI) characterization will be required. The remaining four assemblies (E, F, G, and H) are on portions of the base that will remain open. The investigation, undertaken by EnSafe/Allen & Hoshall (E/A&H), adhered to the requirements of the Hazardous and Solid Waste Amendments portion (HSWA-TN002) of RCRA Permit No. TN2-170-022-600 and applicable regulations.

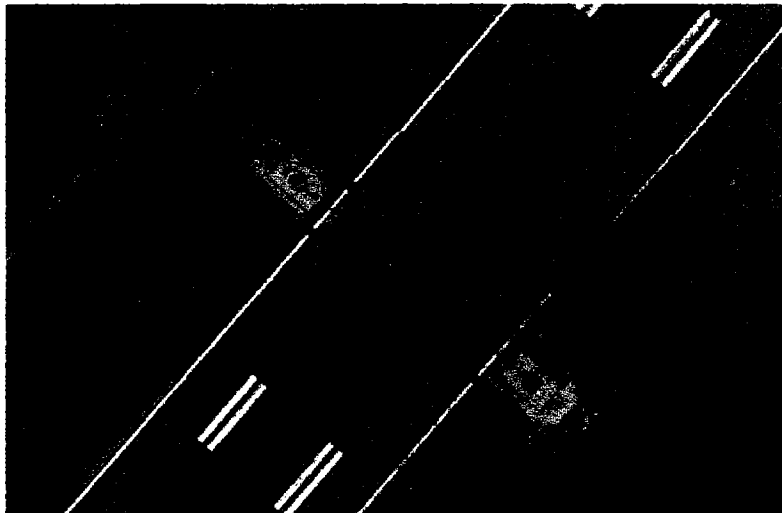
The *Assembly C Site Investigation Plans* (E/A&H, 1995) proposed two phases of investigation for the CSI at SWMU 62. The first phase consisted of a subsurface soil and groundwater investigation using Direct Push Technology (DPT) equipment. Based on the results of the first phase, the second phase, consisting of installing and sampling soil borings and monitoring wells, is not required.

Confirmatory Sampling Investigation Report
Assembly C — SWMU 62, M-21 Arresting Gear
NSA Memphis, Millington, Tennessee
Revision 2: September 25, 1996

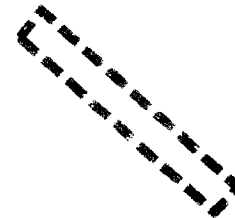
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**SWMU 62
BOUNDARY**



Photograph Scale

0 200 400 Ft.

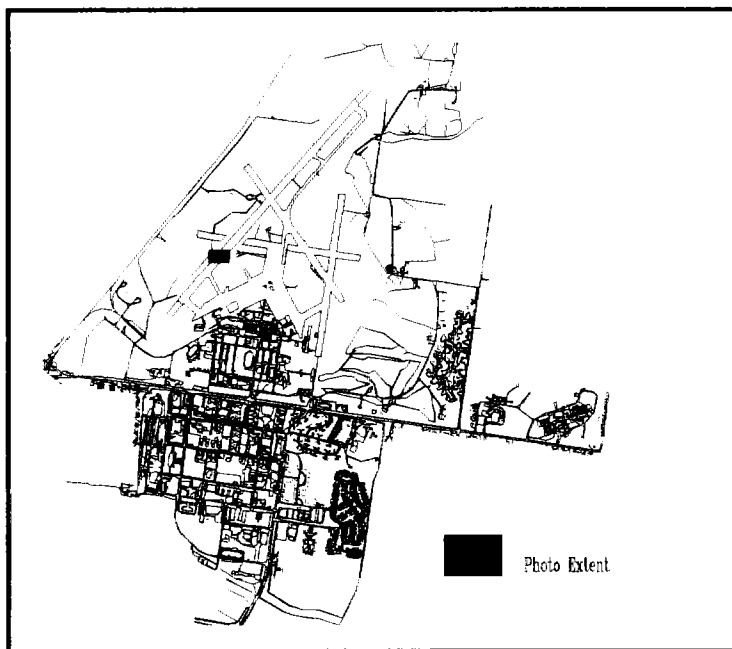
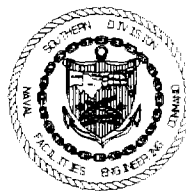


Photo Extent



**RCRA FACILITY INVESTIGATION
NSA MEMPHIS
MILLINGTON, TENNESSEE**

**FIGURE 1-2
DIGITAL ORTHOPHOTOGRAPH
M-21 ARRESTING GEAR
SWMU 62**

AMLI format/level/lat/lon/altitude_d.tif

In addition, three surface-soil samples were collected and analyzed, and the results were used to prepare a Preliminary Risk Evaluation (PRE). The PRE indicates the property is suitable for lease for either residential or commercial land use.

This CSI report summarizes the activities conducted during the first phase of the CSI and provides conclusions, including a recommendation for no further action at SWMU 62.

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2.0 SITE DESCRIPTION AND HISTORICAL INFORMATION

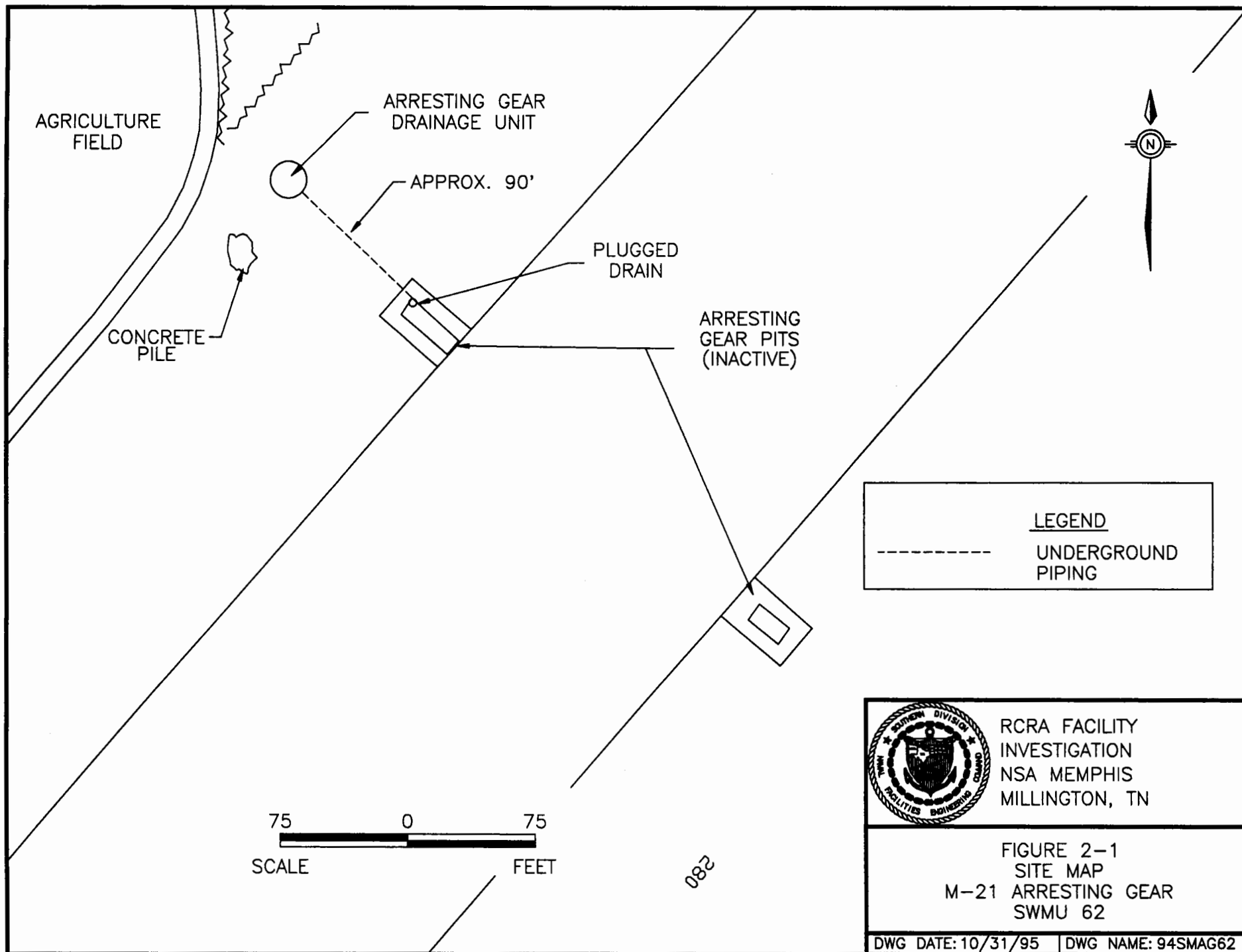
2.1 Site Description

SWMU 62 is the former location of a portable arresting gear mechanism (M-21) on the active Runway 4-22. The site presently consists of two empty, cement-lined, L-shaped containment pits on either side of the runway that once housed the arresting gear. A 4-foot diameter cement cap, approximately 90 feet west of the western containment pit, covers a makeshift drywell, which once received drainage from the containment pit. This area has been disturbed by past activities and is generally level. The site drains southwest along a drainage swale which ultimately empties into the North Fork Creek. Figure 2-1 provides a site map of SWMU 62.

2.2 Historical Site Operations

The gear, which was powered by a generator, was first used in 1985 for pilot training. A 6-inch diameter polyvinyl chloride drain line was installed in the L-shaped containment pit on the west side of the runway to drain any potentially contaminated rainwater which might otherwise collect in the pit. This drain line led to the drywell. No construction details are available for the well itself, but, according to Public Works personnel, it is constructed of three 55-gallon drums welded end-to-end, buried in a 12-foot deep hole, and seated on a bed of gravel. The bottom drum was perforated to allow water to seep out. The residual contaminants from the arresting gear pit (hydraulic fluid, diesel fuel, and lube oil) would enter the drum unit and float on the heavier water, allowing for periodic removal. A pile of leftover cement is approximately 30 feet west of the drywell.

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3.0 PREVIOUS INVESTIGATIONS

No known site investigations were performed before the CSI.

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4.0 FIELD INVESTIGATION AND METHODS

The CSI soil and groundwater sampling program at SWMU 62 was performed to determine if contaminants associated with the arresting gear pits and drywell were present in subsurface soil and groundwater. Specifically, the CSI objectives were:

- Determine the potential for subsurface soil contamination in the loess.
- Determine the potential for groundwater contamination in the loess and fluvial deposits.
- Assess the status/impact from the arresting gear pits and the drywell.
- Determine the suitability of the property for leasing by preparing a PRE.

This section summarizes the soil and groundwater sampling tasks during the first phase of the CSI, which used a hand auger to collect surface soil samples and DPT equipment for subsurface soil and groundwater sampling. The field sampling activities followed the procedures outlined in the U.S. Environmental Protection Agency (USEPA) and Tennessee Department of Environment and Conservation-approved *Comprehensive RFI Work Plan* (E/A&H, 1994) and *Assembly C Site Investigation Plans* (E/A&H, 1995).

Section 4.1 presents the general sampling protocols and rationale for the hand-auger surface-soil investigation and the DPT subsurface soil investigation. Section 4.2 presents the general sampling protocols and rationale for the DPT groundwater investigation. Specific sampling protocols (sample handling, field Quality Assurance/Quality Control [QA/QC], and decontamination) are presented in Section 4.3.

Analytical Parameters

Three surface-soil samples were collected and analyzed to prepare a PRE to determine the suitability of the property for leasing. These samples were shipped to the National Environmental Testing (NET) laboratory in Bedford, Massachusetts, and analyzed for semivolatile organic compounds (SVOCs) by USEPA Method 8270, pesticides/polychlorinated

biphenyls (PCBs) by USEPA Method 8080, and Appendix IX metals by USEPA Method 6010/7000 series.

Subsurface soil and groundwater samples were collected during the DPT investigation to determine the nature and extent of possible petroleum or solvent contamination at SWMU 62 by selecting volatile organic compounds (VOCs) as an indicator parameter. Each sample was transported to Hydrologic, Inc.'s onsite mobile laboratory for the immediate analysis of VOCs by USEPA Method 8021. Approximately 25% of the samples were split (duplicates) for QA/QC purposes during the screening survey. They were shipped to NET for VOC analysis by USEPA Method 8240.

Soil and groundwater samples submitted to Hydrologic's onsite laboratory were analyzed for VOCs using Level II-equivalent Data Quality Objectives (DQOs). Soil and groundwater samples submitted to NET were analyzed using a Level III-equivalent DQO for 95% of the samples and a Level IV-equivalent DQO for 5% of the samples.

E/A&H validated the results of the surface soil samples. Validata Chemical Services, Inc., of Norcross, Georgia, validated the analytical results of the NET confirmation samples collected during the DPT investigation. Attachment 1 contains the validation report, which indicates that the overall data quality of the analytical work is satisfactory.

Hand-Auger Sampling Methods

On February 13, 1996, E/A&H collected three surface soil samples at SWMU 62 using a 3-inch-diameter, stainless-steel hand auger. The hand auger was advanced from land surface to 1 foot below land surface (bls) using a clockwise motion. The soil collected in the auger was placed in a stainless-steel bowl for processing.

DPT Sampling Methods

On May 15, 22, 25, and 26, 1995, E/A&H conducted a DPT survey at SWMU 62 to obtain subsurface soil and groundwater samples for VOC analyses. Subsurface Technologies, Inc. (SST), of Orlando, Florida, provided and operated the DPT equipment, consisting of truck-mounted, hydraulically operated probes which collected subsurface information. The piezocone system, which consists of an electronic cone penetrometer, was used to obtain lithologic information by estimating and plotting point-stress, sleeve friction, and pore pressure as it was advanced from ground surface, through the loess, and into the upper fluvial deposits. The geocone sampler, which is a split-spoon sampler with a push plug on the leading end, was advanced and retracted to retrieve relatively undisturbed subsurface soil samples from specific depths at various locations throughout the SWMU. The hydrocone (a GS-1 groundwater sampler) obtained groundwater samples from specific depths in the upper fluvial deposits, with and without an applied vacuum, and generated hydraulic conductivity information. DPT sampling methods are detailed in Section 4.4.4.3 of the *Comprehensive RFI Work Plan* (E/A&H, 1994).

4.1 Subsurface and Surface Soil Investigation

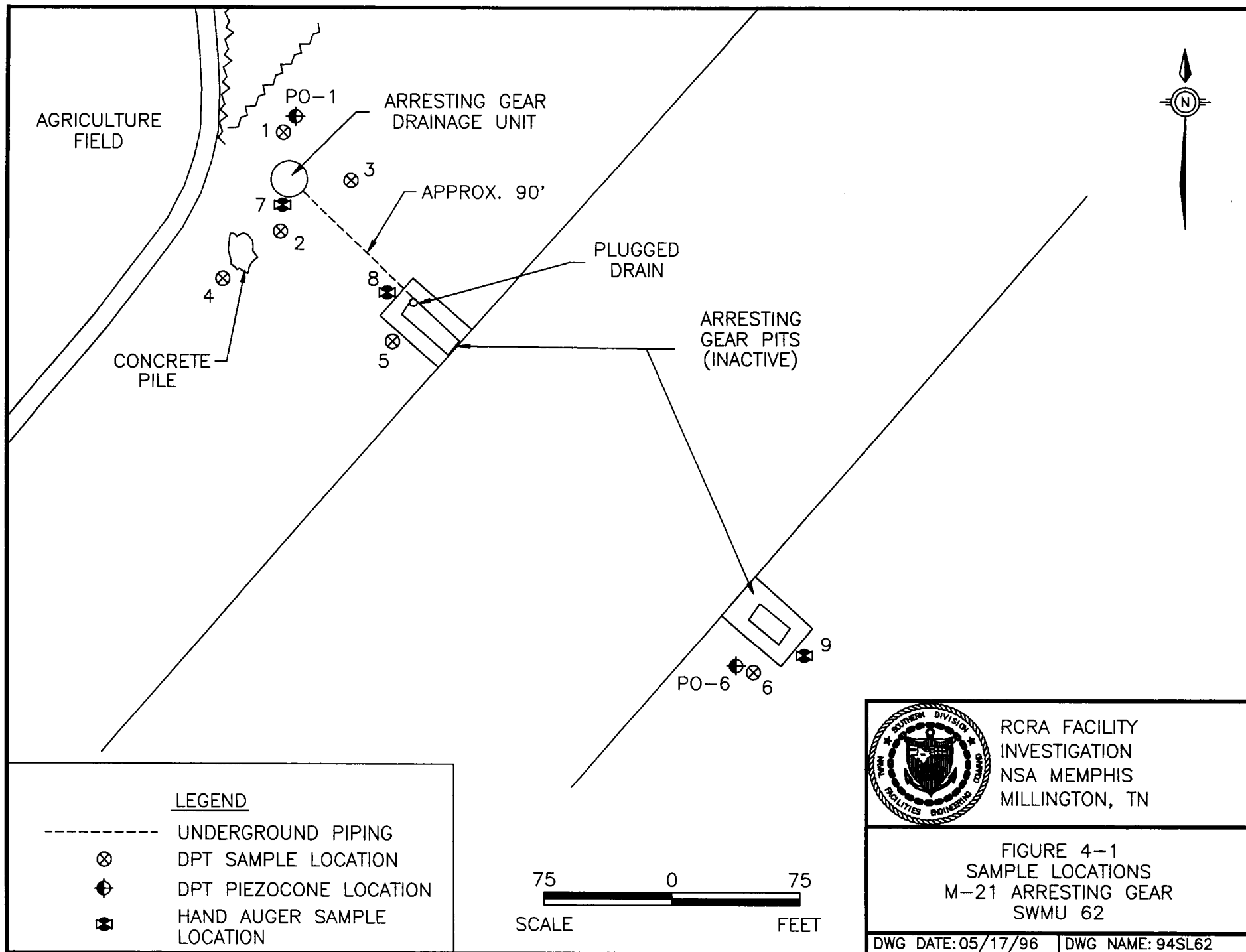
4.1.1 Surface Soil Investigation

The *Comprehensive Sampling Investigation Report for Assembly C* (E/A&H, Revision 0 — November 1, 1995) stated that three surface soil samples would be collected from 0 to 1 foot bls — one immediately adjacent to each arresting gear pit and one next to the drywell. Figure 4-1 shows the sample locations. Each surface soil sample was collected with a decontaminated stainless-steel hand auger and immediately placed in a stainless-steel bowl in preparation for homogenization and containerization.

Surface Soil Sampling Rationale

The surface soil samples were collected near the three most prominent features of the SWMU: the arresting gear pits and the drywell.

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Surface Soil Sample Collection Methods

An E/A&H representative collected the surface soil samples with a stainless-steel hand auger. Upon retrieval, the soil was removed from the hand auger and placed in a stainless-steel bowl for processing. Each sample was homogenized with a clean, stainless-steel spoon in accordance with Section 4.2.10 of the *Region IV USEPA Standard Operating Procedures/Quality Assurance Manual* and containerized as outlined in Section 4.4.4 of the *Comprehensive RFI Work Plan* (E/A&H, 1994). After containerization, each sample was immediately placed on ice for transport to the offsite laboratory. Sample location, designation, and time collected were recorded in the field logbook.

4.1.2 DPT Subsurface Soil Investigation

The DPT investigation assessed the nature and extent of contamination in subsurface soil at SWMU 62. Shallow subsurface soil samples (less than 3 feet bls) were collected from the loess at each of the six DPT locations proposed in the *Assembly C Site Investigation Plans* (E/A&H, 1995). No water-bearing zone was present in the loess; therefore, deeper (17 to 20 feet bls) subsurface soil samples were also collected from this unit. Figure 4-1 shows the DPT sample locations.

Subsurface Soil Sampling Rationale

Before collecting subsurface soil and groundwater samples, SST performed two piezocone soundings (PO-1 and PO-6) to develop a tentative lithologic profile. PO-1 was advanced to the west of the runway next to the drywell, and PO-6 was advanced near the eastern arresting gear pit. Figure 4-1 shows the piezocone locations, and Appendix A contains the piezocone file information and plots. As shown on the piezocone logs and plots, the water-bearing zone in the fluvial deposits is readily identifiable at 38 feet bls (PO-1) and 32 feet bls (PO-6). The piezocone information does not suggest that a water-bearing zone is present in the loess.

The *Assembly C Site Investigation Plans* (E/A&H, 1995) proposed the following shallow soil-sampling intervals: 0 to 1 foot bls near the drywell (Locations 1, 2, 3, and 4) and 2 to 3 feet bls near the arresting gear pits (Locations 5 and 6). Due to poor sample recovery and the presence of roots and vegetation around the drywell, the 1- to 3-foot subsurface soil interval was sampled at Locations 1 and 3, and the 2- to 4-foot interval was sampled at Location 2. The 1- to 3-foot interval was sampled at Locations 4, 5, and 6 to obtain enough sample volume for laboratory analysis.

The *Assembly C Site Investigation Plans* (E/A&H, 1995) proposed collecting a subsurface soil sample from the soil/water interface in the loess if a groundwater sample could not be collected. The piezocone plots did not identify a water-bearing zone in the loess; moreover, split-spoon soil sampling confirmed the absence of groundwater in this zone. Therefore, as outlined in the work plan, a subsurface soil sample was collected from the loess at each of the six proposed DPT sampling stations from the 18- to 20-foot interval (except for Location 3, where the 17-to 19-foot interval was sampled). The following section provides details regarding the subsurface soil sampling procedures.

Subsurface Soil Sample Collection Methods

An E/A&H geologist logged and processed the subsurface soil samples for field screening and submittal to the analytical laboratory. SST collected the samples with the DPT rig using a 2-foot long, 2-inch outside diameter, split-spoon geocone sampler. Upon retrieval, the sampler was opened, and the soil was immediately screened for organic vapors using an HNu (model GP 101, with a 10.2 eV lamp) photoionization detector. No organic vapors were detected. A representative soil sample was collected and placed in a jar for onsite VOC analysis by Hydrologic. Twenty-five percent of the soil samples were split and shipped to NET for confirmation analysis. A description of each soil sample; the field screening results; and sample location, designation, and time collected were recorded in the field logbook.

4.2 DPT Groundwater Investigation

The DPT groundwater investigation focused on the water-bearing zone in the fluvial deposits, which is a preferential zone of groundwater flow and a potential route for contaminant transport. As previously mentioned, the loess at SWMU 62 did not have a water-bearing zone capable of providing groundwater samples. The water-bearing zones at NSA Memphis are described in Section 5, Geology and Hydrogeology.

Groundwater Sampling Rationale

As described in Section 4.1.1, two DPT piezocones were advanced at SWMU 62 to determine the depth of potential water-bearing zones in the loess and fluvial deposits. Based on the piezocone results, no water-bearing zone was identified in the loess, and depth to groundwater in the fluvial deposits ranged from 35 to 40 feet bls. To confirm the absence of a water-bearing zone in the loess, SST advanced the hydrocone to 18 feet bls at Location 1. After 15 minutes, a vacuum was applied to the sampler in an attempt to draw water into the collection device. The sampler was raised 1 foot every 15 minutes in an attempt to find a water-bearing zone, but no groundwater entered the sampler. This procedure was abandoned at 9 feet bls, and subsurface soil samples were collected as outlined in Section 4.1.1.

Groundwater Sample Collection Methods

Groundwater samples were collected during the DPT investigation using the hydrocone. The SST technician advanced the hydrocone to refusal (between 37 and 42 feet bls) at each DPT location to obtain a groundwater sample from the fluvial deposits. The volume of groundwater entering the hydrocone was monitored on the on-board computer screen. When at least 100 milliliters of groundwater had entered the sampler, the hydrocone was retracted. Groundwater samples were collected directly from the sampler by inserting a new piece of Teflon tubing into the bottom port of the hydrocone and decanting the groundwater directly into the sample vials to minimize the loss of VOCs. If no groundwater entered the hydrocone after 30 minutes, a vacuum was applied to the sampling device. After an additional waiting period

(typically 20 minutes), if no water had entered the sampler, it was raised in 1-foot increments every 15 minutes for 1.5 hours in an attempt to find a water-bearing zone.

E/A&H collected a fluvial deposits groundwater sample from Locations 1, 4, 5, and 6 at depths ranging from 38 to 42 feet bls. No fluvial deposits groundwater sample could be collected from Locations 2 and 3; sampler refusal was at 37 and 38 feet, respectively, which apparently was not deep enough to penetrate the water-bearing zone in the fluvial deposits at these locations.

4.3 Sampling Protocol

The CSI sampling activities adhered to the approved *Comprehensive RFI Work Plan* and the *Assembly C Site Investigation Plans*. Sample handling was minimized. When transferring material from the sampling device to containers, the operation was conducted expediently, in as clean an environment as possible. A new pair of disposable gloves was donned before collecting each subsurface soil and groundwater sample. Empty containers were kept packaged until used, at which time they were immediately chilled and isolated in coolers. Subsurface soil samples for VOC analysis were containerized immediately upon collection to minimize the loss of VOCs. Surface soil samples for SVOC, pesticide/PCB, and Appendix IX metals were thoroughly homogenized prior to containerization. Groundwater samples were obtained directly from the hydrocone.

4.3.1 QA/QC Samples

During the DPT investigation, QA/QC samples were collected to test the level of reproducibility attainable in the sampling and analytical processes. QA/QC samples were analyzed for VOCs, as were the associated environmental samples. Soil and groundwater *duplicate* samples, collected at a frequency of 25% during the DPT investigation, were submitted to the offsite laboratory (NET) for confirmation analysis. Duplicate sample analytical results are discussed in Section 6, Nature and Extent of Contamination.

4.3.2 Sample Processing and Chain-of-Custody Procedure

Sample containers requiring chemical preservation (i.e., hydrochloric acid for aqueous samples) were preserved by the testing laboratory and shipped to E/A&H in sealed packages. Sample containers were labeled with the sample identification number, date, sampler's name, and requested analytical parameter, then placed in a cooler immediately following collection. Each sample was logged in the sample logbook. Samples for onsite laboratory analysis were transported by the E/A&H geologist directly to the onsite lab. The Hydrologic chemist recorded each sample in a sample logbook immediately upon receipt.

Samples submitted to NET were prepared for shipment by wrapping each container in bubble wrap, placing it in a resealable plastic bag, and packing it on ice inside a sturdy cooler. Cooler lids were secured with packing tape and sealed with signed custody seals. Packaged samples were then shipped overnight via FedEx priority service for next morning delivery. The offsite laboratory was notified the day of shipment of the number of samples submitted. NET reported all sample shipments arrived in good condition and at the appropriate temperature.

To ensure the integrity of the sample transfer process, a strict chain-of-custody procedure was implemented. This procedure was initiated in the field for each sampling event and conducted through custody transfer to the analytical laboratory. A chain-of-custody form was completed for each batch of samples, itemizing sample numbers, containerization, preservatives, analyses requested, date and time of sampling, and FedEx shipping number. Custody transfers were recorded by signature, date, and time of relinquishment, and receipt of custody by the parties involved.

4.3.3 Sample Labeling

All samples collected in the field were labeled with an alphanumeric code that identifies the site, sample type, and sample location. The first three digits identify the site location, and the fourth digit identifies the sample matrix (S = soil, G = groundwater). The last six digits identify the

sample location and interval. For example, the sample label "062G006038" designates a SWMU 62 groundwater sample collected from Location 6 at a depth of 38 feet. *Note: An exception to the labeling scheme occurred at Location 1. The first two digits identify the SWMU, the second two digits identify the matrix (SG denotes a soil sample collected with the geocone, GH denotes a groundwater sample collected with the hydrocone), and the last four digits identify the sampling station and maximum depth of sample collection. For instance "62SG0120" designates a SWMU 62 soil sample collected with the geocone sampler at Location 1 at a maximum depth of 20 feet.*

4.4 Grouting Procedures

SST filled each DPT boring with neat cement grout following sample collection.

4.5 Decontamination Procedures

SST's downhole field equipment was decontaminated in accordance with guidelines set forth in the *Assembly C Site Investigation Plans* (E/A&H, 1995). All downhole and sampling equipment was decontaminated before and after each use at either the central decontamination pad set up at the N-7 aircraft wash rack, at the decontamination pad east of SWMU 40 across First Avenue, or at the Southside decontamination pad. Rinse water generated from decontamination activities, stored in a 1,200-gallon holding tank at the central decontamination pad, was discharged to the sanitary sewer system after a VOC scan and approval from the City of Millington's wastewater consultant, Fisher & Arnold, Inc.

Decontamination procedures for downhole equipment consisted of the following steps:

- High-pressure wash with a hot soap and water mixture
- Rinse with potable water
- Rinse with deionized organic-free water
- Rinse twice with pesticide-grade isopropyl alcohol

- Rinse with deionized organic-free water
- Wrap with aluminum foil or plastic

A new pair of disposable nitrile gloves was donned before handling decontaminated sampling equipment. Subsurface soil samples were collected directly from the split-spoon sampler, groundwater samples directly from the hydrocone, and surface soil samples directly from the hand auger; therefore, no investigation-derived waste was generated from these sampling activities.

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5.0 GEOLOGY AND HYDROGEOLOGY

5.1 Regional Geology and Hydrogeology

The general hydrogeology of the Memphis area is discussed in detail in Section 2.11 and a conceptual model of the hydrogeology at the NSA is presented in Section 2.12 of the *Comprehensive RFI Work Plan* (E/A&H, 1994). Updated information is available in the *Hydrogeology of Post-Wilcox Group Stratigraphic Units in the Area of the Naval Air Station Memphis, Near Millington, Tennessee* (Kingsbury and Carmichael, 1995), provided in Attachment 2 of this document. On the basis of this updated information, the hydrogeology of NSA Memphis is re-summarized below.

The two stratigraphic units investigated during the RFIs at NSA Memphis are the loess/alluvial deposits of Pleistocene and Holocene age and the underlying fluvial deposits of Pleistocene to Pliocene age. The loess — eolian deposits consisting of silt, silty clay, clay, and minor amounts of sand — is the principal unit occurring at land surface throughout the NSA Memphis Northside. Alluvium, which is restricted to stream valleys, includes alluviated or reworked loess. The loess is typically 0 to 65 feet thick in the Memphis area; at NSA Memphis it ranges from 15 to 45 feet thick. Water-bearing zones are present in the loess primarily in the upper part of this unit; however, yields are low and water quality analyses performed during the water use survey portion of previous underground storage tank investigations indicate that loess groundwater does not meet many primary and secondary drinking water standards. Previous investigations at NSA Memphis have found depth to water in the loess varying between 5 and 15 feet bls and vertical hydraulic conductivities to range from 10^{-6} to 10^{-8} centimeter per second. Although the loess may be considered an aquitard on the basis of the relatively low hydraulic conductivities, this shallowest water-bearing zone is present within this interval. Groundwater flow in the loess is primarily downward, although locally some groundwater in the loess may discharge to nearby streams, drainage ditches, and other surface water bodies.

The fluvial deposits underlie the loess in upland areas and consist of sand, gravel, and some clay, with thin layers of ferruginous sandstone and conglomerate at the base. This unit ranges from 0 to 100 feet thick in the Memphis area; on the Northside of NSA Memphis it ranges from 10 to 60 feet thick and represents the most significant component of the surficial aquifer. Many shallow domestic wells in the Memphis rural areas are completed in the fluvial deposits. Relative groundwater elevations between wells completed in the loess/alluvium and fluvial deposits indicate semiconfined to confined conditions in the fluvial deposits. Typically a downward vertical gradient exists between water in the loess and the fluvial deposits. Sediments in the fluvial deposits generally coarsen with depth, and typically, the upper portion consists of a mixture of very fine sand with varying degrees of silt and clay and becomes increasingly less silty with depth, grading into a fine to medium sand near the middle of the unit. Grain sizes typically coarsen below this interval, grading into a gravelly sand near the fluvial deposits basal section.

The fluvial deposits are underlain by the Cockfield Formation, a part of the Jackson-upper Claiborne confining unit, which is a heterogeneous formation consisting of very fine silty sand interbedded with clay and silt lenses or clay with interbedded fine sand lenses. The Cockfield Formation ranges in thickness from approximately 35 to 180 feet in the NSA Memphis area. The more-permeable characteristics of the fluvial deposits, compared to the relatively impermeable properties of the overlying loess/alluvium and the underlying Jackson-upper Claiborne confining unit, result in the fluvial deposits being the preferential zone of groundwater flow and the route for contaminant transport in NSA Memphis's subsurface.

5.2 Site-Specific Geology and Hydrogeology

The following sections provide site-specific geologic and hydrogeologic information obtained from stratigraphic test borings, previous investigations, and the SWMU 62 DPT investigation.

5.2.1 USGS Stratigraphic Test Boring

The United States Geological Survey (USGS) drilled stratigraphic test hole 2 approximately 700 feet northwest of SWMU 62 in April 1994 (see Figure 1-1). Attachment 2 of this document contains a copy of the previously referenced Kingsbury and Carmichael publication, which provides a geologic cross-section showing test hole 2 (USGS designation Sh:U-98. This boring was drilled 22 feet into the top of the Cook Mountain Formation to better understand the site geology prior to monitoring well installations at NSA Memphis. Cuttings from the test hole were visually logged by a field geologist during drilling, and the test hole was geophysically logged following completion. The stratigraphy and lithologies encountered are as follows:

Loess:	Approximately 45 feet of wind-blown silt deposits (loess). These materials were described as silt and clay.
Fluvial Deposits:	Approximately 51 feet of fluvial deposits. These materials were described as sand and gravel.
Cockfield Formation:	Approximately 82 feet of alternating sand, clay, and some lignite.
Cook Mountain Formation:	The Cook Mountain Formation was characterized as a dense, light olive-gray to greenish-gray clay. It serves as the confining unit separating the Cockfield Formation from the Memphis aquifer. The termination depth of the boring was 200 feet bls, with the top of the Cook Mountain Formation encountered at approximately 178 feet bls.

The USGS collected a Shelby-tube sample from stratigraphic test hole 2 for geotechnical analysis. The vertical permeability of a subsurface soil sample from the 199- to 200-foot interval (Cook Mountain Formation) was 4.5×10^{-5} cm/sec.

5.2.2 Previous Investigations

Site-specific subsurface soil information was collected while implementing the Interim Measures (IM) investigation at SWMU 1, the Fire Department Drill Area, which is approximately 500 feet northwest of SWMU 62 (see Figure 1-1). According to the IM Investigation Report SOUTHNAVFACENGCOM, USGS, E/A&H, March 1993), visual classification indicated low-permeability silts with varying degrees of clay extending to at least 44 feet bls. No permeability data for subsurface soil were collected at SWMU 1.

Based on the topography, the information in the conceptual model of the NSA Memphis hydrogeology (Section 2.12 of the *Comprehensive RFI Work Plan*), recent data collected during Assembly A SWMU RFIs, and communication with USGS representatives, groundwater in the fluvial deposits flows locally toward the north-northwest. Groundwater flow in the loess is primarily downward, although locally some groundwater in the loess may discharge to nearby streams, drainage ditches, and other surface water bodies.

5.2.3 DPT Piezocone Soundings

As outlined in Section 4.1.1 of this document, two piezocone soundings (designated PO-1 and PO-6; refer to Figure 4-1) were performed at SWMU 62 to obtain information about the lithology and potential water-bearing zones before collecting samples. Appendix A provides piezocone logs and plots for SWMU 62. E/A&H used this information to select groundwater sampling intervals for the DPT investigation. As shown on the piezocone logs, the potential water-bearing zones in the fluvial deposits are below 38 feet at PO-1 and below 32 feet at PO-6. These zones are described on the lithologic log as a cemented sand, silty fine sand, and fine sand and are readily identifiable on the associated plots by the higher point stress. Based on the piezocone logs and plots, no definitive water-bearing zone is present in the loess.

5.2.4 DPT Hydrocone Plots

During the DPT investigations, the hydrocone obtained groundwater samples from specific depths in the fluvial deposits. The sampling device, which included a transducer attached to an on-board computer system via an umbilical cable, recorded the fill rate, hydrostatic pressure, and gas pressure. The computer estimated horizontal permeability by applying the time and rate-of-filling data to the standard Bouwer and Rice rate-of-rise permeability models. However, due to an instrument malfunction, only one horizontal permeability measurement was obtained during the SWMU 62 investigation. The horizontal hydraulic permeability of the fluvial deposits at Location 4 (Figure 4-1) was 4.59×10^{-5} cm/sec at a depth of 42 feet. Appendix A provides the hydrocone sample plot and horizontal permeability measurement for the groundwater sample collected from Location 4.

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6.0 NATURE AND EXTENT OF CONTAMINATION

This section presents the results of the surface soil (0 to 1 foot bls), subsurface soil (> 1 foot bls), and groundwater samples collected during the CSI. Surface soil samples were analyzed for SVOCs, pesticides/PCBs, and Appendix IX metals. Subsurface soil and groundwater samples were analyzed for VOCs.

Detected concentrations of organics and inorganics have been compared with media-specific guidance concentrations from the USEPA Region III Risk-Based Concentration (RBC) Table (July to December 1995) to evaluate the risk associated with exposure to soil and groundwater contaminants and to assess the transfer potential of contaminants from soil to groundwater. In addition, metals concentrations for the soil samples are compared with established reference concentrations (RCs) derived from background samples at NSA Memphis to determine if they represent naturally occurring concentrations. Background RC calculations were provided in the *Technical Memorandum — Assemblies A through D Background Reference Concentrations*, E/A&H, September 18, 1996).

Specifically, surface soil sample results are compared with RCs, residential and industrial RBCs, and soil screening levels (SSLs); whereas subsurface soil sample results are compared with RCs and SSLs only (USEPA Region III RBC Table, July to December 1995). Groundwater sample results are compared with RBCs for tap water (USEPA Region III RBC Table, July to December 1995) and the USEPA maximum contaminant level (MCL) for drinking water (USEPA Drinking Water Regulations and Health Advisories, May 1995).

Section 6.1 briefly discusses the criteria used to determine the RCs (two times the mean background concentration) for metals. Section 6.2 summarizes the detected contaminants in soil compared with the respective RBC and/or SSL values. Contaminants identified in surface soil are further evaluated in the Preliminary Risk Evaluation (Section 7). Section 6.3 summarizes the detected constituents in groundwater compared with their RBC and MCL values. Contaminants detected at SWMU 62 are summarized in Section 6.4.

6.1 Background Reference Concentrations

Background locations were established at five areas at NSA Memphis (shown on Figure 6-1) to determine ambient soil and groundwater quality conditions. Background data for soil samples only are discussed here as no SWMU 62 groundwater samples were analyzed for metals. Background data for soil consist of 12 samples collected from five boring locations. The background RCs for metals were calculated by doubling the mean concentration detected. Two RCs were established for soil — one for surface soil (0 to 1 foot bls) and one for subsurface soil (> 1 foot bls). Table 6-1 shows the RCs for metals detected in surface soil.

6.2 Soil Sample Analytical Results

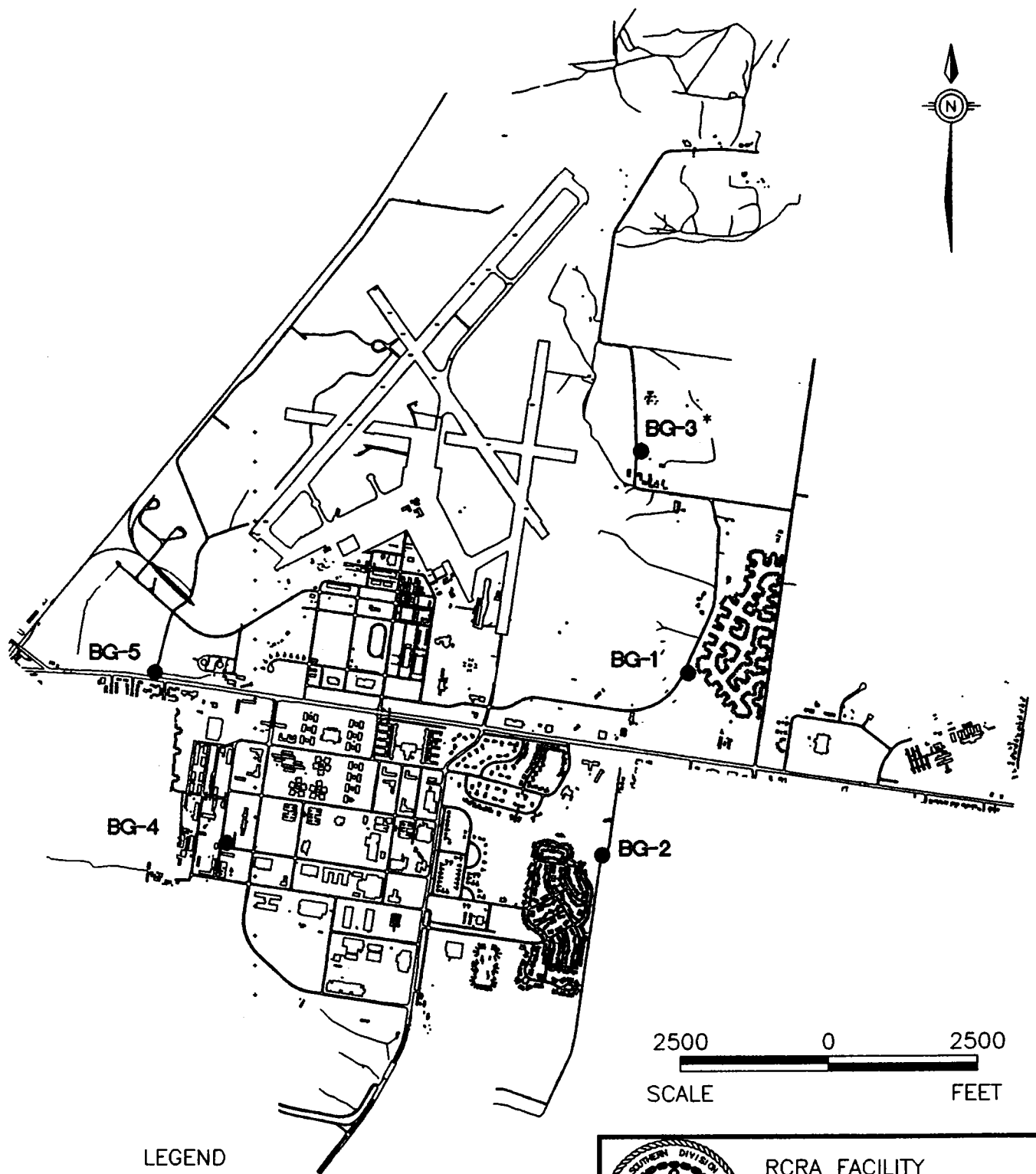
The following sections summarize the results of soil samples collected during the CSI. Appendix B contains the analytical data.

6.2.1 Surface Soil Samples

E/A&H collected three surface soil samples from 0 to 1 foot bls. The samples were analyzed for pesticides/PCBs, SVOCs, and Appendix IX metals. Figure 4-1 shows the surface soil sampling locations, and Table 6-1 summarizes the detected contaminant concentrations.

Pesticides/PCBs

Two pesticides, 4,4'-DDT and dieldrin, were detected in one surface soil sample. The 4,4'-DDT concentration did not exceed its residential RBC or SSL. Although the dieldrin concentration of 0.011 milligrams per kilogram (mg/kg) in surface soil sample 062S000801 exceeded the transfer from soil to groundwater SSL (0.001 mg/kg), it did not exceed the average background concentration (0.131 mg/kg) stated in the June 2, 1995, Technical Memorandum *Discussion of Dieldrin Risk Management Issues* (E/A&H, 1995) or its residential RBC (0.04 mg/kg). As stated in the memorandum, dieldrin is ubiquitous at NSA Memphis as a result



LEGEND

* SOIL BACKGROUND DATA ONLY

BG-2 BACKGROUND LOCATION 2

NOTE: SOIL DATA CONSIST OF ONE SURFACE & TWO SUBSURFACE SOIL SAMPLES. GROUNDWATER DATA CONSIST OF THREE SAMPLES; THE LOESS, UPPER FLUVIAL & LOWER FLUVIAL DEPOSITS.



RCRA FACILITY
INVESTIGATION
NSA MEMPHIS
MILLINGTON, TN

FIGURE 6-1
SOIL & GROUNDWATER
BACKGROUND LOCATIONS

DWG DATE: 10/05/95 DWG NAME: 94SGBL

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Table 6-1
Detected Concentrations of Metals, Pesticides, and SVOCs in Surface Soil
SWMU 62 — M-21 Arresting Gear
(data in milligrams per kilogram)

Analyte	Sample Location/ID				SSL ^b	RBC ^c Residential	RBC ^c Industrial
	7 (0 - 1') 062S000701	8 (0 - 1') 062S000801	9 (0 - 1') 062S000901	RC ^a 0 - 1'			
Metals							
Arsenic	10.5	10.4	9.7	13.2	15	0.43	3.8
Barium	150	113	113	191	32	5,500	140,000
Cadmium	4	3.9	2.9	ND ^d	6	39	1,000
Chromium	8.32 J ^e	12	8.9	26.4	19	390	10,000
Cobalt	10.5 J	9.7 J	8.6 J	20.6	—	4,700	120,000
Copper	18.9	18.9	18	27	—	3,100	82,000
Lead	11.7	14.1	11.1	28.7	None ^f	None ^f	None ^f
Nickel	19.4	16.4	16.3	ND	21	1,600	41,000
Silver	3 J	ND	ND	ND	—	390	10,000
Vanadium	24.1	25.4	20	49.6	—	550	14,000
Zinc	59	54	49.7	88.3	42,000	23,000	610,000
Tin	20.3 J	22.5 J	12 J	ND	—	47,000	1,000,000

Table 6-1
Detected Concentrations of Metals, Pesticides, and SVOCs in Surface Soil
SWMU 62 — M-21 Arresting Gear
(data in milligrams per kilogram)

Analyte	Sample Location/ID				SSL ^b	RBC ^c Residential	RBC ^c Industrial
	7 (0 - 1') 062S000701	8 (0 - 1') 062S000801	9 (0 - 1') 062S000901	RC ^a 0 - 1'			
Organic Compounds							
4,4'-DDT	ND	0.003	ND	—	1	1.9	17
Dieldrin	ND	0.011	ND	0.131 ^b	0.001	0.04	0.36

Notes:

- ^a RC = Reference concentration (2 x the mean background concentration). Background concentrations were established for the 0 to 1-foot and the greater than 1-foot intervals below land surface using analytical data from 12 soil samples collected from five background soil boring locations at various locations on the Northside and Southside of NSA Memphis (*Technical Memorandum — Assemblies A through D Background Reference Concentrations*, E/A&H, September 18, 1996).
- ^b SSL = Soil Screening Level; obtained from the USEPA Region III RBC Table, July to December 1995.
- ^c RBC = Risk-based concentration; obtained from the USEPA Region III RBC Table, July to December 1995.
- ^d ND = Analyte was not detected.
- ^e J = Estimated concentration.
- ^f — = No guidance concentration exists for this analyte.
- ^g = Although there is no published SSL or RBC for lead, USEPA has published a recommended soil screening concentration of 400 mg/kg for residential land use and 1,000 mg/kg for industrial land use (Office of Solid Waste and Emergency Response Directive 9355.4-12).
- ^h = The June 2, 1995 Technical Memorandum *Discussion of Dieldrin Risk Management Issues* (E/A&H, 1995) states that the average concentration of dieldrin in samples collected during a background study at NSA Memphis was 0.131 mg/kg. Though background concentrations are normally assumed to be zero for organic compounds, this value has been included for comparison.

Bold indicates analyte exceeds the RC.

Italics indicates analyte exceeds the soil screening level.

LARGE PRINT indicates analyte exceeds the residential RBC.

of aerial applications during a U.S. Department of Agriculture quarantine on the white-fringed beetle during the 1950s and 1960s. Risk estimates based on the soil dieldrin concentrations at NSA Memphis did not exceed $1\text{E-}4$ Incremental Lifetime Excess Cancer Risk (ILCR). The average concentration of samples collected during a background study was 0.131 mg/kg with a maximum detected concentration of 0.311 mg/kg. As stated in the memorandum, “This finding indicates that dieldrin levels found at each SWMU do not necessitate remedial action in the absence of other significant carcinogenic risk contributors.” In addition, because of the chemical properties of dieldrin and the physical properties of soil, it is not expected to leach in appreciable quantities (if at all) into underlying groundwater.

SVOCs

No SVOCs were detected in the surface soil samples collected from SWMU 62.

Appendix IX Metals

Twelve Appendix IX metals were detected in the surface soil samples (refer to Table 6-1). The residential and industrial RBCs for arsenic (0.43 mg/kg and 3.8 mg/kg, respectively) were exceeded in all three surface soil samples; however the detected arsenic concentrations (9.7 mg/kg to 10.5 mg/kg) did not exceed the RC (13.2 mg/kg) or the SSL (15 mg/kg). The barium concentration in all three samples (ranging from 113 mg/kg to 150 mg/kg) exceeded the SSL (32 mg/kg) but not the RC (191 mg/kg) or the residential RBC (5,500 mg/kg). Cadmium, nickel, silver, and tin concentrations exceeded their RCs but not their SSLs or RBCs.

6.2.2 Subsurface Soil Samples

E/A&H collected 12 subsurface soil samples. Two intervals were sampled at each of the six DPT sampling locations as outlined in Section 4.1. The samples were analyzed for VOCs. Figure 4-1 shows the subsurface soil sampling locations, and Table 6-2 summarizes the detected contaminant concentrations.

Table 6-2
Detected Concentrations of VOCs in Subsurface Soil
SWMU 62 — M-21 Arresting Gear
(data in milligrams per kilogram)

Analyte	Sample Location/ID			SSL ^a
	2 (18' - 20') 062S000220	5 (18' - 20') 062S000520	6 (18' - 20') 062S000620	
n-Propylbenzene	0.0053	ND ^b	ND	— ^c
Methylene chloride	ND	0.002 J ^d	0.001 J	0.010

Notes:

- ^a SSL = Soil Screening Level; obtained from the USEPA Region III RBC Table, July to December 1995.
- ^b ND = Compound not detected.
- ^c — = No reference or guidance concentration exists for this analyte.
- ^d J = Estimated concentration.

No VOCs were detected in soil samples at concentrations exceeding SSLs. The only VOCs detected in the subsurface soil samples were n-propylbenzene in the 18-to 20 foot interval sample at Location 2 (0.0053 mg/kg; no SSL exists), methylene chloride in the 18 to 20-foot interval sample from Location 5 (0.002 mg/kg; SSL = 0.010 mg/kg), and methylene chloride in the 18 to 20-foot sample from Location 6 (0.001 mg/kg). n-Propylbenzene is a common petroleum constituent, and methylene chloride is a common laboratory artifact.

6.3 Groundwater Samples

E/A&H collected groundwater samples from the fluvial deposits at Locations 1, 4, 5, and 6. The groundwater samples were analyzed for VOCs. Figure 4-1 shows the sampling locations, and Table 6-3 summarizes the detected VOCs concentrations.

Table 6-3
Detected Concentrations of VOCs in Groundwater
SWMU 62 — M-21 Arresting Gear
(data in micrograms per liter)

Analyte	Sample Location/ID		MCL ^b Drinking Water
	5 (40' to 41') 062G005041	RBC ^a Tap Water	
Acetone	9 J ^c	3,700	— ^d
Methylene chloride	1 J	4.1	5
Toluene	1 J	750	1,000

Notes:

- ^a RBC = Risk-Based Concentration; obtained from the USEPA Region III RBC Table, July to December 1995.
- ^b MCL = Maximum Contaminant Level for Drinking Water; obtained from the USEPA Drinking Water Regulations and Health Advisories, May 1995.
- ^c J = Estimated concentration
- ^d — = No guidance concentration exists for this analyte.

The only VOCs detected in fluvial deposits groundwater were in the confirmation samples analyzed by the offsite laboratory. The detected VOCs were toluene, acetone, and methylene chloride. No detected VOC exceeded its respective RBC for tap water or MCL for drinking water. Toluene was detected in one sample at 1 microgram per liter ($\mu\text{g/L}$) (RBC = 750 $\mu\text{g/L}$, MCL = 1,000 $\mu\text{g/L}$). Acetone was detected in one sample at 9 $\mu\text{g/L}$ (RBC = 3,700 $\mu\text{g/L}$, no MCL exists). Methylene chloride was detected in one sample at 1 $\mu\text{g/L}$ (RBC = 4.1 $\mu\text{g/L}$ and MCL = 5 $\mu\text{g/L}$). Acetone and methylene chloride are common laboratory artifacts. Figure 4-1 shows the DPT groundwater sampling locations.

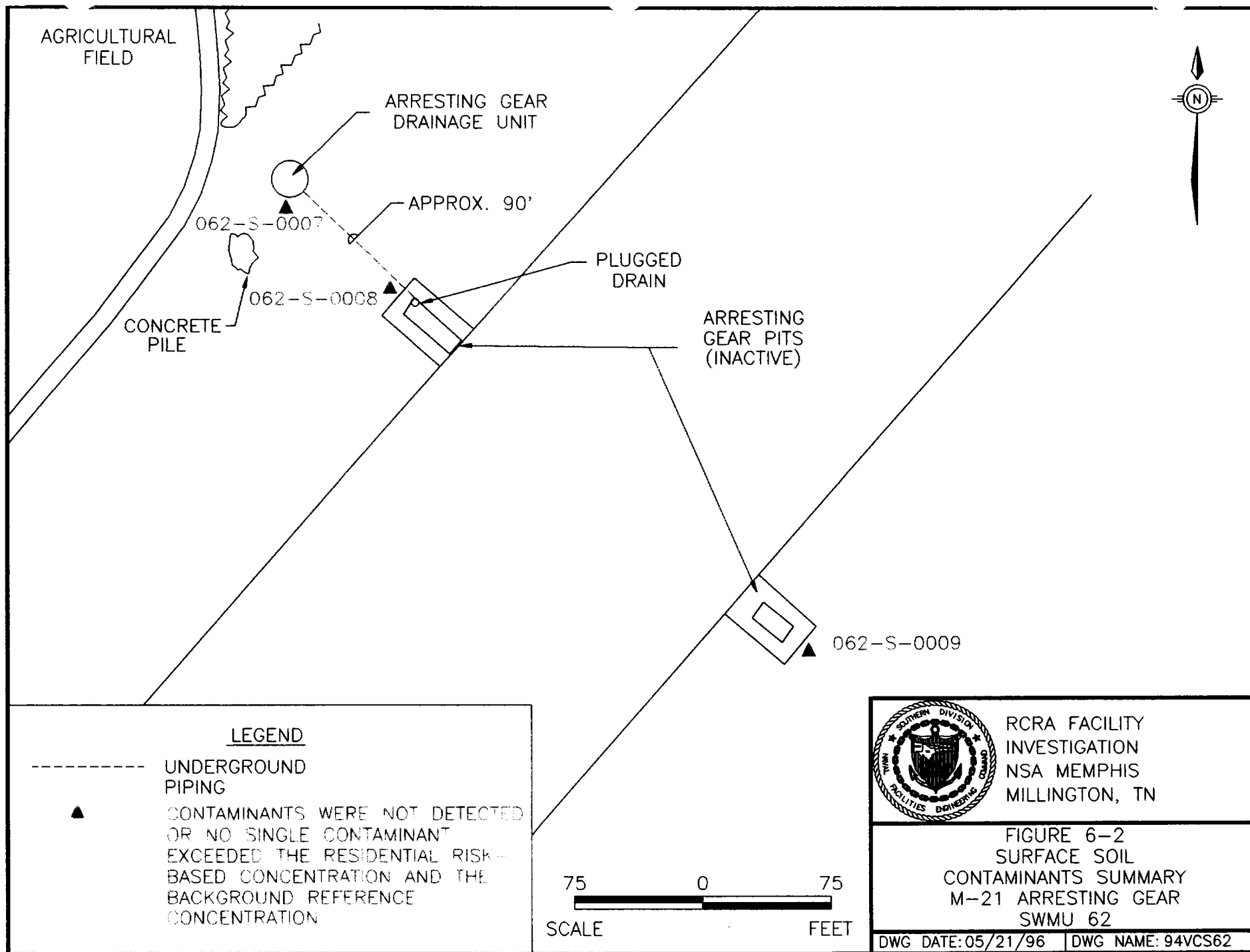
6.4 Summary of Nature and Extent

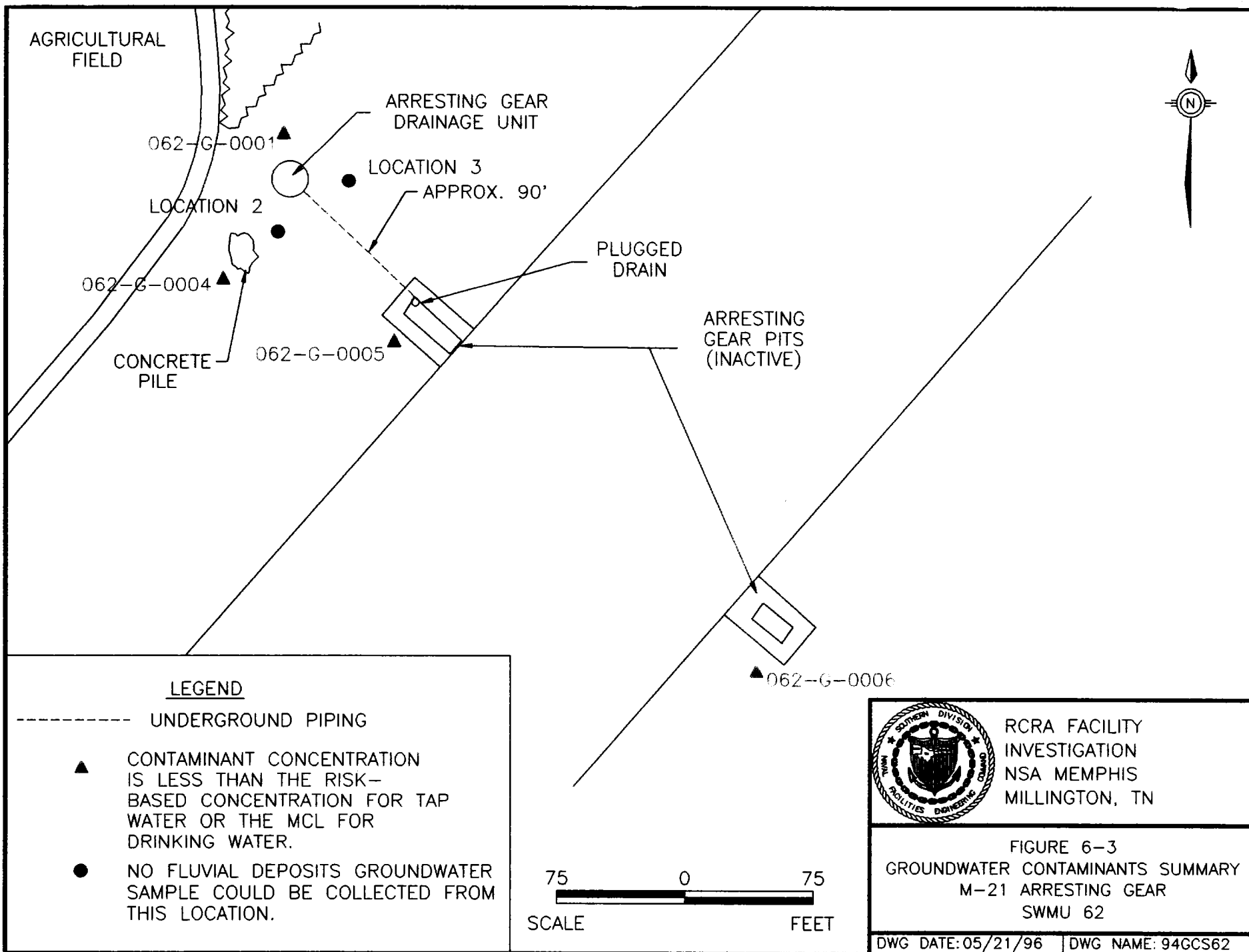
Soil and groundwater analytical results indicate minimal contamination at SWMU 62. No SVOCs were detected in surface soil samples. No detected concentration of any pesticide in surface soil exceeded its residential RBC, and no metals in surface soil exceeded both the residential RBC and RC. No detected concentration of any VOC in subsurface soil exceeded its SSL. No groundwater contaminant exceeded its RBC for tap water or its MCL for drinking water. Figures 6-2 and 6-3 summarize surface soil and groundwater contaminants, respectively.

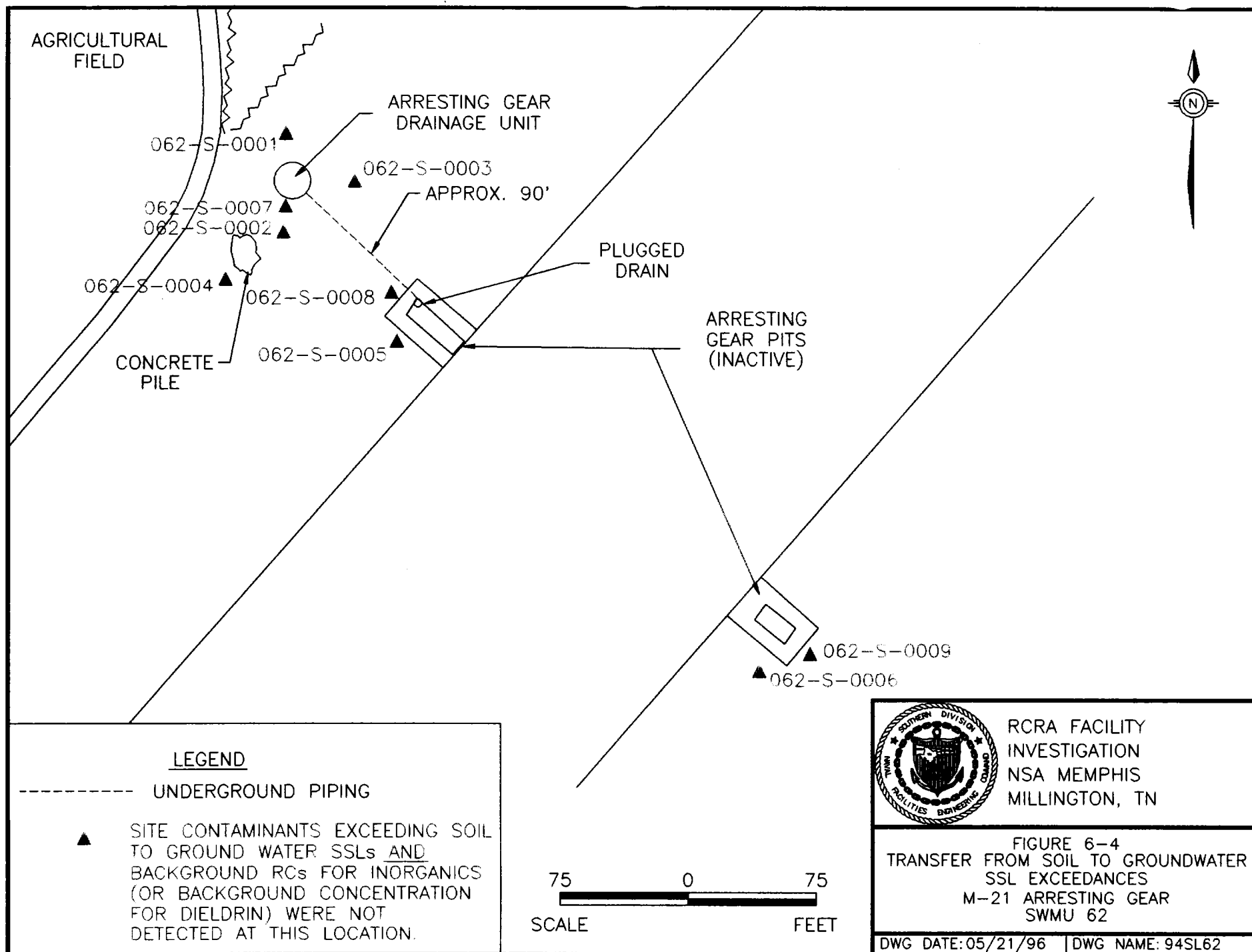
Contaminant Transfer from Soil to Groundwater

Tables 6-1 and 6-2 provide SSL values for transfer from surface and subsurface soil to groundwater. Figure 6-4 illustrates that no contaminant in any soil sample exceeded both the RC (or background concentration for dieldrin) and the SSL.

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7.0 PRELIMINARY RISK EVALUATION

In accordance with Guidance on *Preliminary Risk Evaluations for the Purpose of Reaching a Finding of Suitability to Lease* (USEPA Region IV Memorandum, November 1994), a PRE was conducted for SWMU 62 to finalize the RCRA closure of the SWMU. Three surface soil samples were collected from unpaved areas — one next to each arresting gear pit and one next to the drywell (refer to Figure 4-1). The samples were shipped to an offsite laboratory (NET of Bedford, Massachusetts) under chain-of-custody documentation for the following analyses:

<i>Analysis</i>	<i>Method</i>
SVOCs	USEPA Method 8270
Chlorinated Pesticides/PCBs	USEPA Method 8080
40 CFR 264 Appendix IX Metals	USEPA Method 6010/7000 Series

A PRE is conducted by constructing a table for carcinogenic and systemic (noncarcinogenic) compounds. The maximum concentration for each detected chemical and its corresponding RBC concentration were entered into the table to calculate cumulative human health risk. Soil data used in the calculations are exclusively from samples collected across the surface soil interval (0 to 1 foot bls).

Proportionate risk is calculated for each detected site chemical by comparing its maximum reported concentration with the corresponding RBC value. Risk and hazard for residential and commercial scenarios were calculated separately. RBC values were calculated by USEPA based on a risk threshold of 10^{-6} for carcinogens or a hazard quotient threshold of 1.0 for noncarcinogens. Therefore, a risk ratio is calculated for each contaminant by one of the following two equations:

$$\text{Carcinogenic Risk Ratio: } RR = \frac{\text{media concentration}}{\text{screening value}} \times TR$$

$$\text{Noncarcinogenic Risk Ratio: } RR = \frac{\text{media concentration}}{\text{screening value}} \times THQ$$

where:

RR	=	the risk ratio
Media Concentration	=	the maximum concentration of a site chemical
Screening Value	=	the RBC value for that particular chemical
TR	=	target risk used by USEPA to calculate RBCs for carcinogens (10^{-6})
THQ	=	target hazard quotient used by USEPA to calculate RBCs for noncarcinogens (1.0)

Tables 7-1 and 7-2 summarize PRE results for SWMU 62 for carcinogens and noncarcinogens, respectively. The risk ratios for each chemical are summed separately for both residential and commercial scenarios to determine the overall site risk. For each scenario, cumulative risk (for carcinogens) and cumulative hazard index (HI) (for noncarcinogens) are calculated separately, and the cumulative risk and HI are each compared to the corresponding cumulative threshold in accordance with the November 1994 USEPA Region IV Memorandum.

If the carcinogenic ILCR is greater than 10^{-4} (the cumulative risk threshold) or the noncarcinogenic HI is greater than 1 (the cumulative HI threshold), the site may require additional investigation for the corresponding land use scenario (USEPA Region IV Memorandum, November 1994). If neither threshold is exceeded, the property is considered suitable to lease for the specified land use scenario.

TABLE 7-1
PRELIMINARY RISK EVALUATION FOR SWMU 62
RESIDENTIAL AND COMMERCIAL CARCINOGENS
NSA MEMPHIS RFI

Parameter	Reference Concentration (mg/kg)	Maximum (mg/kg)	Residential RBC Carcinogen (mg/kg)	Risk Ratio	Commercial RBC Carcinogen (mg/kg)	Risk Ratio
* Arsenic	13.1	10.5	0.43		3.8	
Barium	19.1	150				
Cadmium	ND	4				
Chromium	26.4	12				
Cobalt	15	10.5				
Copper	23.6	18.9				
4,4'-DDT		0.003	1.9	1.6E-09	17	1.76E-10
Dieldrin		0.011	0.04	2.8E-07	0.36	3.06E-08
Lead	28.7	14.1				
Nickel	ND	19.4				
Silver	ND	3				
Tin		22.5				
Vanadium	49.6	25.4				
Zinc	88.3	59				
		ILCR	SUM	3E-07	SUM	3E-08

NOTES:

ILCR Incremental excess lifetime cancer risk

HI Hazard index

Blank spaces Indicates not applicable

ND Not detected

- All concentrations are in parts per million (mg/kg).
- The maximum concentration reported for each contaminant was used to develop the table above.
- Soil sample data were from the surface (0-1') interval only.
- Screening values (RBCs) are from the July to December 1995 Risk-Based Concentration (RBC) Table (October 20, 1995 USEPA Region III RBC memo).
- The maximum lead (Pb) concentration reported at SWMU 62 was 14.1 mg/kg. This is less than the 400 mg/kg residential soil screening level for total lead (USEPA OSWER Directive 9355.4-12).
- * Metal was excluded from the risk ratio because the maximum reported concentration is less than the corresponding reference concentration.

TABLE 7-2
PRELIMINARY RISK EVALUATION FOR SWMU 62
RESIDENTIAL AND COMMERCIAL NONCARCINOGENS
NSA MEMPHIS RFI

Parameter	Reference Concentration (mg/kg)	Maximum (mg/kg)	Residential RBC Noncarcinogen (mg/kg)	Hazard Ratio	Commercial RBC Noncarcinogen (mg/kg)	Hazard Ratio
* Arsenic	13.1	10.5				
Barium	19.1	150	5500	0.027	140000	0.0011
Cadmium	ND	4	39	0.10	1000	0.004
* Chromium	26.4	12	390		10000	
* Cobalt	15	10.5	4700		120000	
* Copper	23.6	18.9	2900		76000	
4,4'-DDT		0.003				
Dieldrin		0.011				
Lead	28.7	14.1				
Nickel	ND	19.4	1600	0.012	41000	0.00047
Silver	ND	3	390	0.0077	10000	0.0003
Tin		22.5	1000000	0.00002	47000	0.00048
* Vanadium	49.6	25.4	550		14000	
* Zinc	88.3	59	23000		610000	
		HI	SUM	0.14968	SUM	0.00632

NOTES:

- ILCR Incremental excess lifetime cancer risk
- HI Hazard index
- Blank spaces Indicates not applicable
- ND Not detected
- All concentrations are in parts per million (mg/kg).
- The maximum concentration reported for each contaminant was used to develop the table above.
- Soil sample data were from the surface (0-1') interval only.
- Screening values (RBCs) are from the July to December 1995 Risk-Based Concentration (RBC) Table (October 20, 1995 USEPA Region III RBC memo).
- The maximum lead (Pb) concentration reported at SWMU 62 was 14.1 mg/kg. This is less than the 400 mg/kg residential soil screening level for total lead (USEPA OSWER Directive 9355.4-12).
- * Metal was excluded from the risk ratio because the maximum reported concentration is less than the corresponding reference concentration.

This PRE does not evaluate the potential exposure that might be experienced by construction workers should site structures be excavated in the future. This would require an acute or subchronic assessment of subsurface soil data. For the site worker scenario, USEPA recommends an exposure duration of 25 years — a chronic exposure scenario. Exposure durations less than seven years, as would be assumed for a construction worker scenario, are considered acute or subchronic. RBCs would be less conservative if calculated based on a subchronic or an acute exposure scenario. USEPA used chronic-based toxicological information when calculating RBCs, or USEPA made conservative adjustments to reflect chronic exposure. In addition to the effect the exposure duration differences would have on a construction worker's cumulative risk and hazard estimates, toxicological information used by USEPA to calculate RBCs would be adjusted to reflect acute or subchronic toxicological endpoints rather than the chronic endpoints typically used. Acute and subchronic thresholds are based on lower exposure durations than chronic thresholds, and higher concentrations are generally necessary to elicit observable toxic effects. Higher thresholds for toxic effects result in less conservative toxicological information, which would be used to adjust RBCs for either acute or subchronic exposure. Because a construction worker would be exposed under either acute or subchronic conditions, and RBCs based on chronic exposure are generally more conservative, the commercial site worker scenario presented in this PRE would be a more conservative scenario than that for a construction worker. Subsurface soil concentrations would have to be significantly higher relative to those reported in surface soil to pose risk equivalent to that estimated for surface soil.

The Preferred Reuse Alternative in the *Base Reuse and Development Plan* (RKG Associates Inc., 1995), indicates the most likely reuse of the parcel of land containing SWMU 62 will be for airfield operations. Due to the nature of this proposed use, a commercial setting can be assumed to evaluate risk. With respect to the commercial scenario, the resulting ILCR and HI were well below the established criteria of 10^{-4} and 1, respectively. In addition, the resulting

ILCR and HI for the residential scenario were below the established 10^{-4} ILCR threshold and the HI threshold of 1.

Conclusions and Recommendations

Based on the information gathered during this investigation, the following conclusions and recommendations have been reached:

- SWMU 62 will likely be used for airfield operations.
- Fourteen pesticides and inorganics were detected in the three surface soil samples.
- The maximum reported concentration of arsenic exceeded residential and commercial RBCs; however, the detected concentration does not exceed the reference (background) concentrations as shown on Tables 7-1 and 7-2.
- Based on a PRE performed on data from the samples collected from 0 to 1 foot bls:
 - Carcinogens — Neither the *commercial* nor *residential* ILCRs exceeded the 10^{-4} threshold, indicating suitability for lease with no further action for both commercial and residential land use.
 - Noncarcinogens — Neither the *commercial* nor *residential* HIs exceeded 1, indicating suitability for lease with no further action for both commercial and residential land use.

8.0 CONCLUSIONS AND RECOMMENDATIONS

Three surface soil samples collected near the arresting gear pits and drywell were analyzed for SVOCs, pesticides/PCBs, and Appendix IX metals, and the results were used to prepare a PRE. Twelve subsurface soil samples and four fluvial deposits groundwater samples were collected near the arresting gear pits and the drywell associated with SWMU 62 and analyzed for VOCs. Based on the information gathered during this investigation, the following conclusions and recommendations have been reached:

- No SVOCs were detected in surface soil samples.
- No detected concentration of any pesticide exceeded its residential RBC.
- No detected concentration of any metal in surface soil exceeded both its residential RBC and its SSL.
- No detected concentration of any VOC in subsurface soil exceeded its SSL.
- No groundwater contaminant exceeded its RBC for tap water or its MCL for drinking water.
- The PRE concluded that the property is suitable for lease for either residential or commercial land use.

Based on the results of the investigation and the PRE at SWMU 62, no further action is recommended for this site.

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9.0 REFERENCES

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Appendix A
DPT Piezocone and Hydrocone Plots

PIEZOCONE SOUNDING LOG

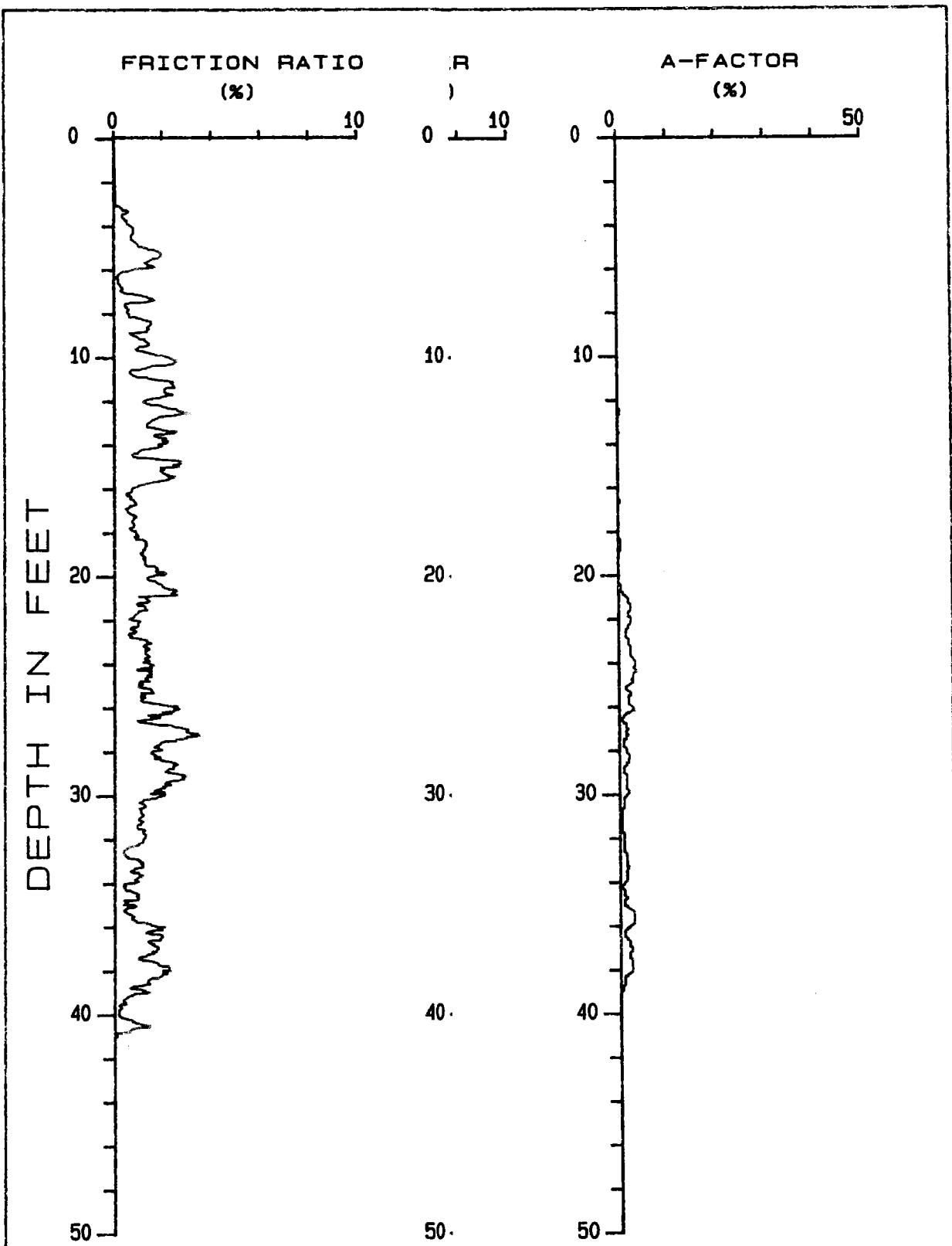
Page: 1

 SOUNDING #: 62-P01 CLIENT: ENSAFE DATE: 05-15-1995
 JOB NAME OR #: NASM094 LOCATION: SWMU62 ST1 DEPTH OF GROUNDWATER: 18 FE

Depth	PP	PT	SL	FR	Soil Type	N	VES	FA	RD	YM	USS	SEN	CM	OCR
4.00	-0.14	92.69	0.59	0.63	Silty Fine Sand	23	0.05	>45	100+	204	---	---	556	---
5.00	-0.17	92.43	1.12	1.22	Silty Fine Sand	23	0.10	>45	98	203	---	---	555	---
6.00	0.09	47.55	0.73	1.53	Silty to Clayey F.S.	16	0.15	>45	73	105	---	---	285	---
7.00	-0.25	41.28	0.16	0.38	Silty Fine Sand	10	0.20	44	65	91	---	---	248	---
8.00	-0.03	56.71	0.40	0.70	Silty Fine Sand	14	0.24	45	71	125	---	---	340	---
9.00	0.01	45.89	0.63	1.37	Silty to Clayey F.S.	15	0.29	43	62	101	---	---	275	---
10.00	-0.03	46.12	0.78	1.69	Silty to Clayey F.S.	15	0.34	42	60	101	---	---	277	---
11.00	-0.02	47.96	0.51	1.06	Silty to Clayey F.S.	16	0.39	42	59	106	---	---	288	---
12.00	-0.02	50.85	0.78	1.53	Silty to Clayey F.S.	17	0.44	41	59	112	---	---	305	---
13.00	-0.03	54.38	0.77	1.41	Silty to Clayey F.S.	18	0.49	41	60	120	---	---	326	---
14.00	0.01	31.77	0.71	2.22	Clayey Fine Sand	13	0.54	---	---	416	2.1	2.7	64	>10
15.00	-0.00	34.33	0.70	2.03	Clayey Fine Sand	14	0.59	---	---	450	2.2	3.0	69	>10
16.00	-0.03	29.02	0.21	0.72	Silty to Clayey F.S.	10	0.63	36	38	64	---	---	174	---
17.00	-0.02	38.06	0.18	0.48	Silty to Clayey F.S.	13	0.68	37	45	84	---	---	228	---
18.00	-0.05	34.31	0.26	0.76	Silty to Clayey F.S.	11	0.73	36	41	75	---	---	206	---
19.00	0.06	33.63	0.32	0.96	Silty to Clayey F.S.	11	0.76	36	40	74	---	---	202	---
20.00	-0.05	40.67	0.78	1.91	Clayey Fine Sand	16	0.79	---	---	532	2.7	3.1	81	>10
21.00	0.21	12.49	0.54	4.34	Clay	12	0.82	---	---	156	0.8	1.4	62	4
22.00	0.29	11.95	0.11	0.91	Clayey Fine Sand	5	0.85	---	---	148	0.7	6.6	60	3
23.00	0.28	15.75	0.20	1.27	Clayey Fine Sand	6	0.88	---	---	198	1.0	4.7	79	5
24.00	0.31	9.34	0.15	1.61	Sandy Clay	5	0.91	---	---	112	0.6	3.7	47	2
25.00	0.32	17.29	0.14	0.79	Clayey Fine Sand	7	0.94	---	---	218	1.1	7.6	86	5
26.00	0.37	14.50	0.38	2.64	Sandy Clay	7	0.97	---	---	180	0.9	2.3	73	4
27.00	0.34	20.55	0.65	3.15	Sandy Clay	10	0.99	---	---	261	1.3	1.9	41	7
28.00	0.37	24.77	0.47	1.89	Clayey Fine Sand	10	1.02	---	---	317	1.6	3.2	50	
32.00	0.39	40.09	0.55	1.37	Silty to Clayey F.S.	13	1.15	34	39	88	---	---	241	---
33.00	0.46	34.29	0.18	0.53	Silty to Clayey F.S.	11	1.18	33	34	75	---	---	206	---
34.00	0.40	43.70	0.26	0.60	Silty to Clayey F.S.	15	1.21	35	41	96	---	---	262	---
35.00	0.41	41.90	0.23	0.54	Silty to Clayey F.S.	14	1.24	34	39	92	---	---	251	---
36.00	0.67	35.22	0.38	1.09	Silty to Clayey F.S.	12	1.27	33	34	77	---	---	211	---
37.00	0.72	30.42	0.52	1.71	Clayey Fine Sand	12	1.30	---	---	388	1.9	3.5	61	11
38.00	0.74	31.21	0.75	2.40	Clayey Fine Sand	12	1.33	---	---	398	2.0	2.5	62	
40.00	-0.16	241.74	0.37	0.15	Cemented Sand to HardPan	40	1.40	43	87	532	---	---	1450	---

PP - Pore Pressure (Kg/cm2) N - Equivalent SPT Blow Count (bpf) USS - Undrained Shear Strength
 PT - Point Bearing (Kg/cm2) VES - Vertical Effective Stress (Kg/cm2) SEN - Sensitivity
 SL - Sleeve Friction (Kg/cm2) FA - Friction Angle (Degrees) CM - Constrained Modulus
 FR - Friction Ratio (%) RD - Relative Density (+ or - 5%) OCR - Estimated Over Consolidation Ratio
 GWD - Ground Water Depth YM - Youngs Modulus

The above data was computed utilizing SST's in-house correlations and guidelines published in 'Guidelines for Use and Interpretation of the Electronic Cone Penetration Test', Robertson and Campanella, September, 1989.



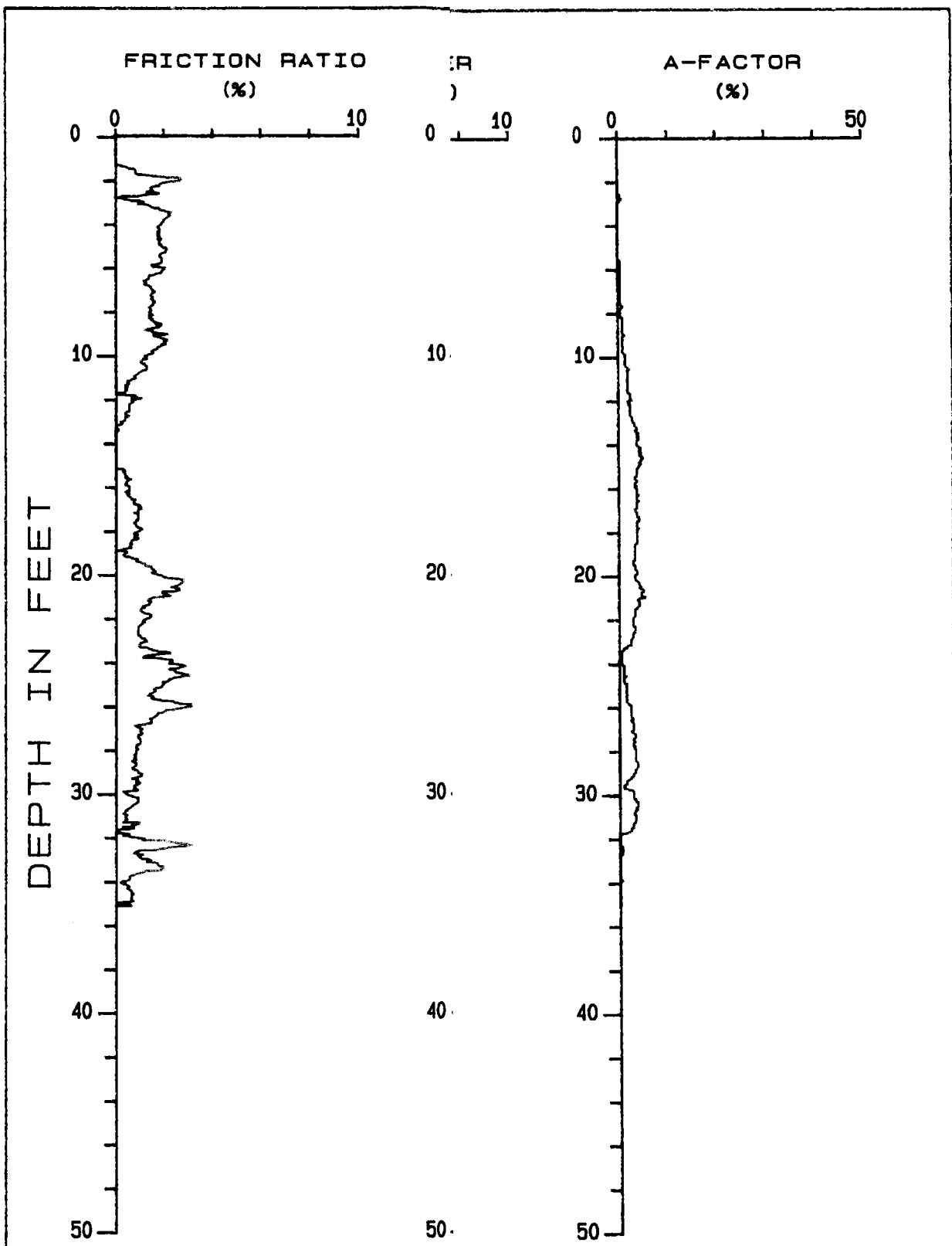
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JOB: NASM094 CLIENT: TECHNOLOGY

 SOUNDING #: 62-P06 CLIENT: ENSAFE DATE: 05-22-1995
 JOB NAME OR #: NASM094 LOCATION: SWMU62 ST6 DEPTH OF GROUNDWATER: 18 FE

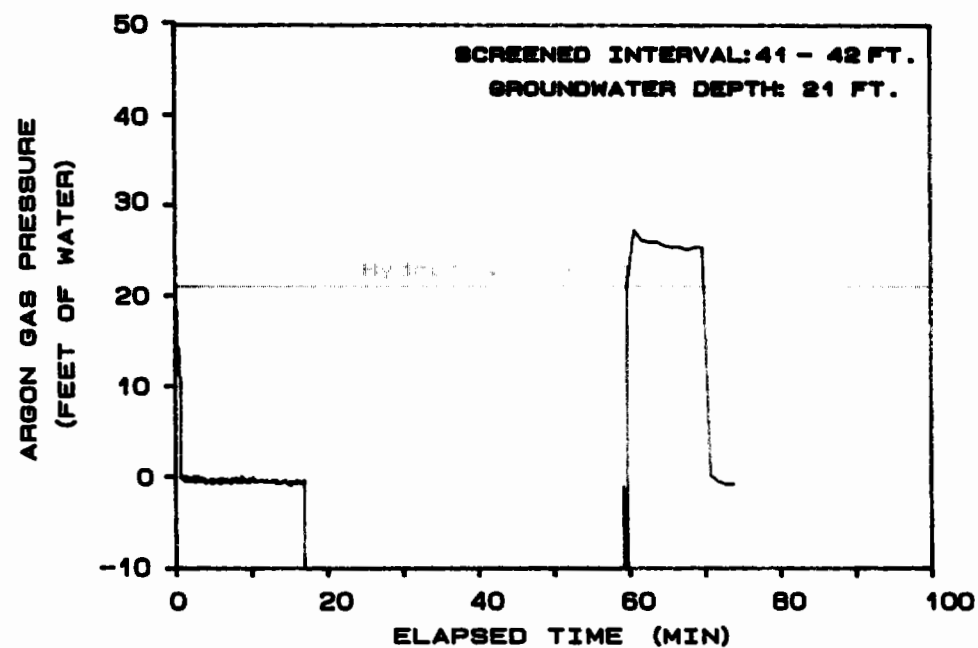
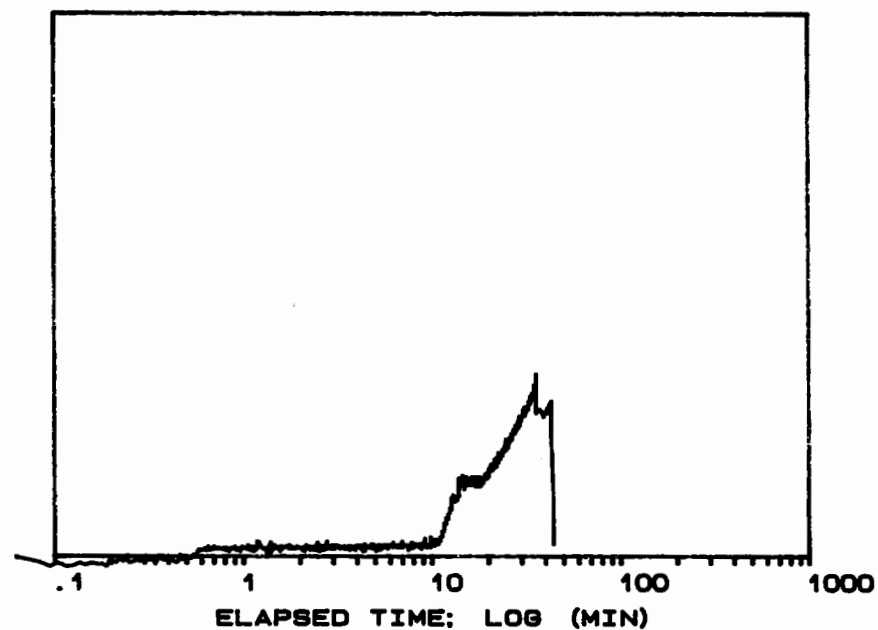
Depth	PP	PT	SL	FR	Soil Type	N	VES	FA	RD	YM	USS	SEN	CM	OCR
2.00	-0.09	27.85	0.49	1.76	Clayey Fine Sand	11	0.05	---	---	371	1.9	3.4	56	>10
3.00	0.05	24.71	0.02	0.06	Silty to Clayey F.S.	8	0.10	>45	60	54	---	---	148	---
4.00	0.03	29.16	0.56	1.92	Clayey Fine Sand	12	0.15	---	---	387	1.9	3.1	58	>10
5.00	0.01	32.16	0.56	1.75	Clayey Fine Sand	13	0.20	---	---	426	2.1	3.4	64	>10
6.00	0.11	25.15	0.54	2.15	Clayey Fine Sand	10	0.24	---	---	332	1.7	2.8	50	>10
7.00	0.13	27.31	0.38	1.38	Clayey Fine Sand	11	0.29	---	---	360	1.8	4.3	55	>10
8.00	0.15	27.57	0.35	1.25	Clayey Fine Sand	11	0.34	---	---	363	1.8	4.8	55	>10
9.00	0.23	16.81	0.28	1.64	Clayey Fine Sand	7	0.39	---	---	219	1.1	3.7	84	>10
10.00	0.24	19.53	0.31	1.57	Clayey Fine Sand	8	0.44	---	---	255	1.3	3.8	98	>10
11.00	0.32	16.34	0.16	0.97	Clayey Fine Sand	7	0.49	---	---	211	1.1	6.2	82	>10
12.00	0.38	18.92	0.12	0.65	Clayey Fine Sand	8	0.54	---	---	245	1.2	9.2	95	>10
13.00	0.44	14.19	0.06	0.40	Clayey Fine Sand	6	0.59	---	---	181	0.9	15.1	71	
15.00	0.51	12.42	-0.07	0.57	Clayey Fine Sand	5	0.68	---	---	156	0.8	10.5	62	5
16.00	0.59	16.38	0.07	0.40	Clayey Fine Sand	7	0.73	---	---	209	1.0	14.9	82	9
17.00	0.61	17.92	0.17	0.92	Clayey Fine Sand	7	0.78	---	---	228	1.1	6.5	90	10
18.00	0.66	17.81	0.14	0.78	Clayey Fine Sand	7	0.83	---	---	226	1.1	7.7	89	8
19.00	0.73	22.79	0.07	0.30	Silty to Clayey F.S.	8	0.86	33	27	50	---	---	137	---
20.00	0.76	22.54	0.33	1.48	Clayey Fine Sand	9	0.89	---	---	289	1.4	4.0	45	
23.00	1.06	45.24	0.41	0.91	Silty to Clayey F.S.	15	0.98	36	44	100	---	---	271	---
24.00	0.29	102.62	2.40	2.34	Silty to Clayey F.S.	34	1.01	41	68	226	---	---	616	---
25.00	0.73	55.07	1.31	2.38	Clayey Fine Sand	22	1.05	---	---	720	3.6	2.5	110	>10
26.00	0.87	35.22	1.12	3.19	Sandy Clay	18	1.07	---	---	455	2.3	1.9	70	>10
27.00	0.95	37.41	0.39	1.06	Silty to Clayey F.S.	12	1.10	34	37	82	---	---	224	---
28.00	1.01	32.37	0.29	0.91	Silty to Clayey F.S.	11	1.13	33	33	71	---	---	194	---
29.00	1.14	43.49	0.23	0.52	Silty Fine Sand	11	1.17	35	41	96	---	---	261	---
30.00	0.78	30.00	0.26	0.85	Silty to Clayey F.S.	10	1.20	32	30	66	---	---	180	---
31.00	0.93	30.56	0.10	0.33	Silty to Clayey F.S.	10	1.23	32	30	67	---	---	183	---
32.00	-0.29	272.69	1.15	0.42	Cemented Sand to HardPan	45	1.26	44	92	600	---	---	1636	---
33.00	0.17	126.25	1.29	1.02	Silty Fine Sand	32	1.29	40	70	278	---	---	757	---
34.00	0.05	191.25	0.71	0.37	Fine Sand	38	1.33	42	82	421	---	---	1147	---
35.00	-0.18	397.05	2.42	0.61	Cemented Sand to HardPan	66	1.36	>45	100+	874	---	---	2382	---

PP - Pore Pressure (Kg/cm2) N - Equivalent SPT Blow Count (bpf) USS - Undrained Sheer Strength
 PT - Point Bearing (Kg/cm2) VES - Vertical Effective Stress (Kg/cm2) SEN - Sensitivity
 SL - Sleeve Friction (Kg/cm2) FA - Friction Angle (Degree) CM - Constrained Modulus
 FR - Friction Ratio (%) RD - Relative Density (+ or - 5%) OCR - Estimated Over Consolidation Ratio
 GWD - Ground Water Depth YM - Youngs Modulus

The above data was computed utilizing SST's in-house correlations and guidelines published in 'Guidelines for Use and Interpretation of the Electronic Cone Penetration Test', Robertson and Campanella, September, 1989.



SOUNDING #: (PERFORMED BY:
DATE: 05-22-1995 LOCATION: SUBSURFACE
JOB: NASM094 CLIENT: TECHNOLOGY



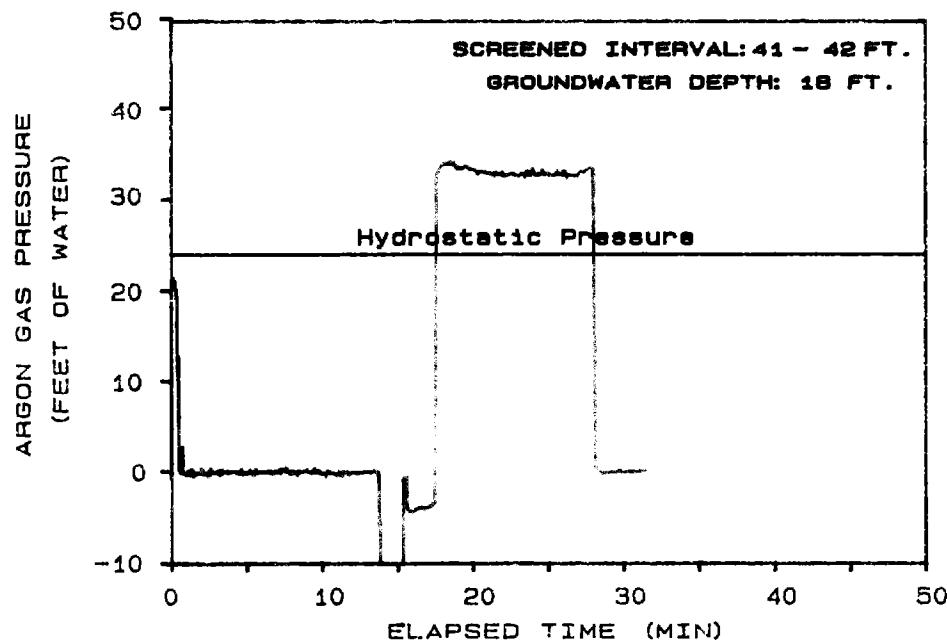
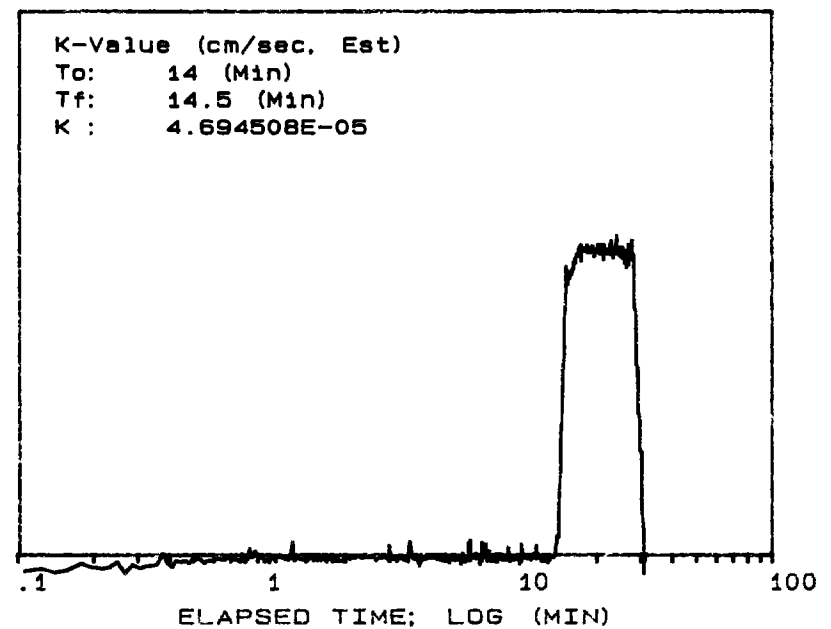
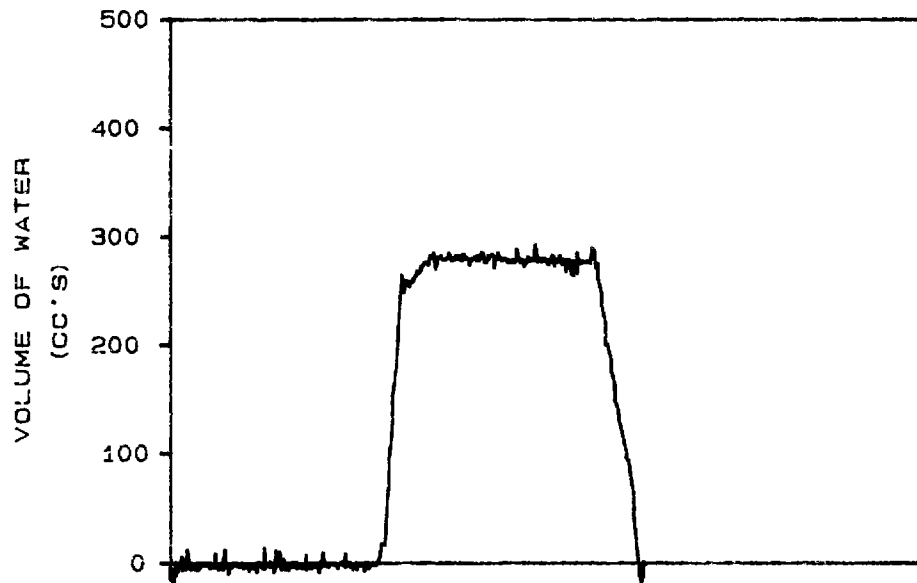
GS-1 SAMPLE PLOT

SAMPLE #: 62GHO141

CLIENT: ENSAFE JOB: NASMO94
DATE: 05-15-1995 LOCATION: SWMU82 ST1

PERFORMED BY:

SUBSURFACE
TECHNOLOGY



GS-1 SAMPLE PLOT

SAMPLE #: 62GH0442

CLIENT: ENSAFE

JOB: NASM094

DATE: 05-25-1995

LOCATION: SWMU62 ST4

PERFORMED BY:

SUBSURFACE
TECHNOLOGY

Appendix B
Analytical Data

FORMAT: XXXX \ 1 2 3 4 5 6 7 8 9 0

XXXX \ - OPTIONAL project prefix
1 2 3 - SITE where sample collected
4 - MATRIX / QC code
5 6 7 8 - SAMPLING LOCATION
9 0 - DEPTH, INTERVAL, SERIAL #

All spaces MUST be filled and no extra characters included.
Use zeroes as space-fillers. Indicate MS/MSDs on COCs.

MATRIX/QC CODES:

S - soil (surface, borings, and trenches)
C - soil duplicate sample
M - sediment (settled, fluid-borne solid)
N - sediment duplicate
G - groundwater
H - groundwater duplicate sample
W - surface water
R - surface water duplicate sample
U - sludge
Y - sludge duplicate
A - air
Z - liquid waste (including IDW drums)
V - solid waste (including IDW drums)

T - trip blank
E - equipment rinsate blank
D - DI system blank
P - potable water blank
F - field blank
L - filter blank
B - EPA blind spike sample
2 - cement blank
3 - drilling mud
4 - grout blank
5 - bentonite blank
6 - sand blank

DATALCP3
05/17/96

NSA MEMPHIS
NAS MEMPHIS, RFI, ASSEMBLY C
SWMU 62 - SURFACE SOIL SAMPLES

Page: 1
Time: 13:00

APX9-METAL		SAMPLE ID ----->	062-S-0007-01	062-S-0008-01	062-S-0009-01			
		ORIGINAL ID ----->	062S000701	062S000801	062S000901			
		LAB SAMPLE ID ---->	142608S	142609S	142610S			
		ID FROM REPORT -->	062S000701	062S000801	062S000901			
		SAMPLE DATE ----->						
		MATRIX ----->	Soil	Soil	Soil			
		UNITS ----->	MG/KG	MG/KG	MG/KG			
CAS #	Parameter		1695 VAL	1695 VAL	1695 VAL			
SB	Antimony		7.3 UJ	7.2 UJ	7.3 UJ			
AS	Arsenic		10.5	10.4	9.7			
BA	Barium		150.	113.	113.			
BE	Beryllium		0.98 U	0.96 U	0.97 U			
CD	Cadmium		4.	3.9	2.9			
CR	Chromium		8.3	12.	8.9			
CO	Cobalt		10.5 J	9.7 J	8.6 J			
CU	Copper		18.9	18.9	18.			
PB	Lead		11.7	14.1	11.1			
HG	Mercury		0.12 U	0.12 U	0.12 U			
NI	Nickel		19.4	16.4	16.3			
SE	Selenium		0.49 U	0.48 U	0.49 U			
AG	Silver		3. J	0.72 UJ	0.73 UJ			
TL	Thallium		0.73 U	0.72 U	0.73 U			
V	Vanadium		24.1	25.4	20.			
ZN	Zinc		59.	54.	49.7			
SN	Tin		20.3 J	22.5 J	12. J			

*** Validation Complete ***

DATALCP3
05/17/96

NSA MEMPHIS
NAS MEMPHIS, RFI, ASSEMBLY C
SWMU 62 - SURFACE SOIL SAMPLES

Page: 2
Time: 13:00

SUB46-PEST		SAMPLE ID -----> 062-S-0007-01		062-S-0008-01		062-S-0009-01				
		ORIGINAL ID -----> 062S000701		062S000801		062S000901				
		LAB SAMPLE ID ----> 142608		142609		142610				
		ID FROM REPORT --> 062S000701		062S000801		062S000901				
		SAMPLE DATE -----> 02/13/96		02/13/96		02/13/96				
		DATE EXTRACTED --> 02/15/96		02/15/96		02/15/96				
		DATE ANALYZED ----> 02/20/96		02/20/96		02/20/96				
		MATRIX -----> Soil		Soil		Soil				
		UNITS -----> UG/KG		UG/KG		UG/KG				
CAS #	Parameter	1695	VAL	1695	VAL	1695	VAL			
309-00-2	Aldrin	2.	U	2.	U	2.	U			
58-89-9	gamma-BHC (Lindane)	2.	U	2.	U	2.	U			
319-84-6	alpha-BHC	2.	U	2.	U	2.	U			
319-85-7	beta-BHC	2.	U	2.	U	2.	U			
319-86-8	delta-BHC	2.	U	2.	U	2.	U			
57-74-9	Chlordane	41.	U	40.	U	41.	U			
72-54-8	4,4'-DDD	4.1	U	4.	U	4.1	U			
72-55-9	4,4'-DDE	4.1	U	4.	U	4.1	U			
50-29-3	4,4'-DDT	4.1	U	3.	J	4.1	U			
60-57-1	Dieldrin	4.1	U	11.	U	4.1	U			
959-98-8	Endosulfan I	2.	U	2.	U	2.	U			
33213-65-9	Endosulfan II	4.1	U	4.	U	4.1	U			
1031-07-8	Endosulfan sulfate	4.1	U	4.	U	4.1	U			
72-20-8	Endrin	4.1	U	4.	U	4.1	U			
7421-93-4	Endrin aldehyde	4.1	U	4.	U	4.1	U			
76-44-8	Heptachlor	2.	U	2.	U	2.	U			
1024-57-3	Heptachlor epoxide	2.	U	2.	U	2.	U			
72-43-5	Methoxychlor	20.	U	20.	U	20.	U			
8001-35-2	Toxaphene	41.	U	40.	U	41.	U			
12674-11-2	Aroclor-1016	41.	U	40.	U	41.	U			
11104-28-2	Aroclor-1221	41.	U	40.	U	41.	U			
11141-16-5	Aroclor-1232	41.	U	40.	U	41.	U			
53469-21-9	Aroclor-1242	41.	U	40.	U	41.	U			
12672-29-6	Aroclor-1248	41.	U	40.	U	41.	U			
11097-69-1	Aroclor-1254	41.	U	40.	U	41.	U			
11096-82-5	Aroclor-1260	41.	U	40.	U	41.	U			
53494-70-5	Endrin ketone	NR		NR		NR				
5103-71-9	alpha-Chlordane	NR		NR		NR				
5103-74-2	gamma-Chlordane	NR		NR		NR				
1114-16-5		NR		NR		NR				
12789-03-6	Technical Chlordane	NR		NR		NR				

*** Validation Complete ***

NSA MEMPHIS
NAS MEMPHIS, RFI, ASSEMBLY C
SWMU 62 - SURFACE SOIL SAMPLES

SW846-SVOA		SAMPLE ID ----->	062-S-0007-01	062-S-0008-01	062-S-0009-01			
		ORIGINAL ID ----->	062S000701	062S000801	062S000901			
		LAB SAMPLE ID ---->	142608	142609	142610			
		ID FROM REPORT -->	062S000701	062S000801	062S000901			
		SAMPLE DATE ----->						
		DATE EXTRACTED -->	02/16/96	02/16/96	02/16/96			
		DATE ANALYZED ---->	02/20/96	02/20/96	02/20/96			
		MATRIX ----->	Soil	Soil	Soil			
		UNITS ----->	ug/Kg	ug/Kg	ug/Kg			
CAS #	Parameter	1695	VAL	1695	VAL	1695	VAL	
108-95-2	Phenol	410.	U	400.	U	410.	U	
111-44-4	bis(2-Chloroethyl)ether	410.	U	400.	U	410.	U	
95-57-8	2-Chlorophenol	410.	U	400.	U	410.	U	
541-73-1	1,3-Dichlorobenzene	410.	U	400.	U	410.	U	
106-46-7	1,4-Dichlorobenzene	410.	U	400.	U	410.	U	
95-50-1	1,2-Dichlorobenzene	410.	U	400.	U	410.	U	
95-48-7	2-Methylphenol (o-Cresol)	410.	U	400.	U	410.	U	
108-60-1	2,2'-oxybis(1-Chloropropane)	410.	U	400.	U	410.	U	
106-44-5	4-Methylphenol (p-Cresol)	410.	U	400.	U	410.	U	
621-64-7	N-Nitroso-di-n-propylamine	410.	U	400.	U	410.	U	
67-72-1	Hexachloroethane	410.	U	400.	U	410.	U	
98-95-3	Nitrobenzene	410.	U	400.	U	410.	U	
78-59-1	Isophorone	410.	U	400.	U	410.	U	
88-75-5	2-Nitrophenol	410.	U	400.	U	410.	U	
105-67-9	2,4-Dimethylphenol	410.	U	400.	U	410.	U	
120-83-2	2,4-Dichlorophenol	410.	U	400.	U	410.	U	
120-82-1	1,2,4-Trichlorobenzene	410.	U	400.	U	410.	U	
91-20-3	Naphthalene	410.	U	400.	U	410.	U	
106-47-8	4-Chloroaniline	410.	UJ	400.	UJ	410.	UJ	
87-68-3	Hexachlorobutadiene	410.	U	400.	U	410.	U	
111-91-1	bis(2-Chloroethoxy)methane	410.	U	400.	U	410.	U	
59-50-7	4-Chloro-3-methylphenol	410.	U	400.	U	410.	U	
91-57-6	2-Methylnaphthalene	410.	U	400.	U	410.	U	
77-47-4	Hexachlorocyclopentadiene	410.	U	400.	U	410.	U	
88-06-2	2,4,6-Trichlorophenol	410.	U	400.	U	410.	U	
95-95-4	2,4,5-Trichlorophenol	1000.	U	1000.	U	1000.	U	
91-58-7	2-Chloronaphthalene	410.	U	400.	U	410.	U	
88-74-4	2-Nitroaniline	1000.	U	1000.	U	1000.	U	
131-11-3	Dimethyl phthalate	410.	U	400.	U	410.	U	
208-96-8	Acenaphthylene	410.	U	400.	U	410.	U	
606-20-2	2,6-Dinitrotoluene	410.	U	400.	U	410.	U	
99-09-2	3-Nitroaniline	1000.	U	1000.	U	1000.	U	
83-32-9	Acenaphthene	410.	U	400.	U	410.	U	
51-28-5	2,4-Dinitrophenol	1000.	U	1000.	U	1000.	U	
100-02-7	4-Nitrophenol	1000.	U	1000.	U	1000.	U	
132-64-9	Dibenzofuran	410.	U	400.	U	410.	U	

DATALCP3
05/17/96

NSA MEMPHIS
NAS MEMPHIS, RFI, ASSEMBLY C
SWMU 62 - SURFACE SOIL SAMPLES

Page: 4
Time: 13:00

SW846-SVOA		SAMPLE ID ----->		062-S-0007-01	062-S-0008-01	062-S-0009-01			
		ORIGINAL ID ----->		062S000701	062S000801	062S000901			
		LAB SAMPLE ID ---->		142608	142609	142610			
		ID FROM REPORT -->		062S000701	062S000801	062S000901			
		SAMPLE DATE ----->							
		DATE EXTRACTED -->		02/16/96	02/16/96	02/16/96			
		DATE ANALYZED ---->		02/20/96	02/20/96	02/20/96			
		MATRIX ----->		Soil	Soil	Soil			
		UNITS ----->		ug/Kg	ug/Kg	ug/Kg			
CAS #	Parameter	1695	VAL	1695	VAL	1695	VAL		
121-14-2	2,4-Dinitrotoluene	410.	U	400.	U	410.	U		
84-66-2	Diethylphthalate	410.	U	400.	U	410.	U		
7005-72-3	4-Chlorophenylphenylether	410.	U	400.	U	410.	U		
86-73-7	Fluorene	410.	U	400.	U	410.	U		
100-01-6	4-Nitroaniline	1000.	U	1000.	U	1000.	U		
534-52-1	2-Methyl-4,6-Dinitrophenol	1000.	U	1000.	U	1000.	U		
86-30-6	N-Nitrosodiphenylamine	410.	UJ	400.	UJ	410.	UJ		
101-55-3	4-Bromophenyl-phenylether	410.	U	400.	U	410.	U		
118-74-1	Hexachlorobenzene	410.	U	400.	U	410.	U		
87-86-5	Pentachlorophenol	1000.	U	1000.	U	1000.	U		
85-01-8	Phenanthrene	410.	U	400.	U	410.	U		
120-12-7	Anthracene	410.	U	400.	U	410.	U		
86-74-8	Carbazole	410.	U	400.	U	410.	U		
84-74-2	Di-n-butylphthalate	410.	U	400.	U	410.	U		
206-44-0	Fluoranthene	410.	U	400.	U	410.	U		
129-00-0	Pyrene	410.	U	400.	U	410.	U		
85-68-7	Butylbenzylphthalate	410.	U	400.	U	410.	U		
91-94-1	3,3'-Dichlorobenzidine	410.	U	400.	U	410.	U		
56-55-3	Benzo(a)anthracene	410.	U	400.	U	410.	U		
218-01-9	Chrysene	410.	U	400.	U	410.	U		
117-81-7	bis(2-Ethylhexyl)phthalate (BEHP)	410.	U	400.	U	410.	U		
117-84-0	Di-n-octyl phthalate	410.	U	400.	U	410.	U		
205-99-2	Benzo(b)fluoranthene	410.	U	400.	U	410.	U		
207-08-9	Benzo(k)fluoranthene	410.	U	400.	U	410.	U		
50-32-8	Benzo(a)pyrene	410.	U	400.	U	410.	U		
193-39-5	Indeno(1,2,3-cd)pyrene	410.	U	400.	U	410.	U		
53-70-3	Dibenz(a,h)anthracene	410.	U	400.	U	410.	U		
191-24-2	Benzo(g,h,i)perylene	410.	U	400.	U	410.	U		

*** Validation Complete ***

NAS MEMPHIS
NAS MEMPHIS, RFI, ASSEMBLY C
SWMU 62 - Primary Samples

VOA		SAMPLE ID ----->	062-C-0020-20	062-C-0050-20	062-H-0050-41	062-C-0060-20		
		ORIGINAL ID ----->	062C002020	062C005020	062H005041	062C006020		
		LAB SAMPLE ID ---->	123957	123956	123959	123955		
		ID FROM REPORT -->	062C002020	062C005020	062H005041	062C006020		
		SAMPLE DATE ----->	05/23/95	05/23/95	05/23/95	05/23/95		
		DATE ANALYZED --->	05/26/95	05/26/95	05/27/95	05/26/95		
		MATRIX ----->	Soil	Soil	Water	Soil		
		UNITS ----->	UG/KG	UG/KG	UG/L	UG/KG		
CAS #	Parameter	1411	VAL	1411	VAL	1411	VAL	
74-87-3	Chloromethane	13.	U	13.	U	10.	U	
74-83-9	Bromomethane	13.	U	13.	U	10.	U	
75-01-4	Vinyl chloride	13.	U	13.	U	10.	U	
75-00-3	Chloroethane	13.	U	13.	U	10.	U	
75-09-2	Methylene chloride	13.	U	2.	J	1.	J	
67-64-1	Acetone	13.	U	16.	U	9.	J	
75-15-0	Carbon disulfide	13.	U	13.	U	10.	U	
75-35-4	1,1-Dichloroethene	13.	U	13.	U	10.	U	
75-34-3	1,1-Dichloroethane	13.	U	13.	U	10.	U	
540-59-0	1,2-Dichloroethene (total)	13.	U	13.	U	10.	U	
67-66-3	Chloroform	13.	U	13.	U	10.	U	
107-06-2	1,2-Dichloroethane	13.	U	13.	U	10.	U	
78-93-3	2-Butanone (MEK)	13.	U	13.	U	10.	U	
71-55-6	1,1,1-Trichloroethane	13.	U	13.	U	10.	U	
56-23-5	Carbon tetrachloride	13.	U	13.	U	10.	U	
75-27-4	Bromodichloromethane	13.	U	13.	U	10.	U	
78-87-5	1,2-Dichloropropane	13.	U	13.	U	10.	U	
10061-01-5	cis-1,3-Dichloropropene	13.	U	13.	U	10.	U	
79-01-6	Trichloroethene	13.	U	13.	U	10.	U	
124-48-1	Dibromochloromethane	13.	UJ	13.	UJ	10.	U	
79-00-5	1,1,2-Trichloroethane	13.	UJ	13.	UJ	10.	U	
71-43-2	Benzene	13.	U	13.	U	10.	U	
10061-02-6	trans-1,3-Dichloropropene	13.	U	13.	U	10.	U	
75-25-2	Bromoform	13.	U	13.	U	10.	U	
108-10-1	4-Methyl-2-Pentanone (MIBK)	13.	U	13.	U	10.	U	
591-78-6	2-Hexanone	13.	U	13.	U	10.	U	
127-18-4	Tetrachloroethene	13.	U	13.	U	10.	U	
79-34-5	1,1,2,2-Tetrachloroethane	13.	U	13.	U	10.	U	
108-88-3	Toluene	13.	U	13.	U	1.	J	
108-90-7	Chlorobenzene	13.	U	13.	U	10.	U	
100-41-4	Ethylbenzene	13.	U	13.	U	10.	U	
100-42-5	Styrene	13.	U	13.	U	10.	U	
1330-20-7	Xylene (Total)	13.	U	13.	U	10.	U	

*** Validation Complete ***

HydroLogic Mobile Laboratory
Analytical Results - Volatile Organic C
Memphis Naval Air Station

Sample Location: 62SG0103
Lab File ID: nas66.001
Calibration Std.: vc0515.001

Date: 05/15/95
Blank: blk0515.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	69.9	67.7	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	12	
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Results - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location: 63SG0120
Lab File ID: nas67.001
Calibration Std.: vc0515.001

Date: 05/15/95
Blank: blk0515.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	74	73.2	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	9	12
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Results - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location: 62GH0141
Lab File ID: nas65.001
Calibration Std.: vc0515.001

Date: 05/15/95
Blank: blk0515.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	85.8	105	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	BDL	12
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
 Analytical Results - Volatile Organic Compounds
 Memphis Naval Air Station

Sample Location: 062S002004
 Lab File ID: NAS121.001
 Calibration Std.: vc0522.001

Date: 05/22/95
 Blank: blk0522.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	60.4	51.2	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	10.	14
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Results - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location:062S002020
Lab File ID:NAS120.001
Calibration Std.:vc0522.001

Date: 05/22/95
Blank: bik0522.001

Dilution: 0.887

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	67.2	68.8	
40,42	BDL	n/a	
n-Propylbenzene	5.3	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	6	14
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Results - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location:062S003003
Lab File ID:NAS152.001
Calibration Std.:vc0526.001

Date: 05/26/95
Blank: blk0526.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	76.9	24.9	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	5	16
Methylenechloride	n/a	25	17
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Results - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location:062S003019
Lab File ID:NAS153.001
Calibration Std.:vc0526.001

Date: 05/26/95
Blank: bik0526.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	81.5	25.9	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	16
Methylenechloride	n/a	24	17
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Results - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location:062S004003
Lab File ID:NAS150.001
Calibration Std.:vc0525.001

Date: 05/25/95
Blank: blk0525.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	78.4	99.3	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	8	16
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Results - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location:062S004020
Lab File ID:NAS149.001
Calibration Std.:vc0525.001

Date: 05/25/95
Blank: blk0525.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	83	110	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	8	16
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
 Analytical Results - Volatile Organic Compounds
 Memphis Naval Air Station

Sample Location: 062G004042
 Lab File ID: NAS148.001
 Calibration Std.: vc0525.001

Date: 05/25/95
 Blank: blk0525.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	94.5	139	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	BDL	16
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
 Analytical Results - Volatile Organic Compounds
 Memphis Naval Air Station

Sample Location:062S005003

Date: 05/22/95

Dilution:

1

Lab File ID:NAS123.001

Blank: blk0522.001

Calibration Std.:vc0522.001

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	53.2	37.5	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	14	
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Results - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location:062S005003
Lab File ID:NAS123A.001
Calibration Std.:vc0524.001

Date: 05/24/95
Blank: blk0524.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Halt (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	63.5	28.2	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	32	15
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
 Analytical Results - Volatile Organic Compounds
 Memphis Naval Air Station

Sample Location: 062S005020
 Lab File ID: NAS122.001
 Calibration Std.: vc0522.001

Date: 05/22/95
 Blank: blk0522.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	65.8	58.1	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	9.	14
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Results - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location:062G005041
Lab File ID:NAS119.001
Calibration Std.:vc0522.001

Date: 05/22/95
Blank: blk0522.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	73.9	76.1	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	6.	14
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Results - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location:062S006003
Lab File ID:NAS124.001
Calibration Std.:vc0522.001

Date: 05/22/95
Blank: blk0522.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	59.5	47.4	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	14	14
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Results - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location: 062S006020
Lab File ID: NAS125.001
Calibration Std.: vc0522.001

Date: 05/22/95
Blank: blk0522.001

Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	55.7	39.7	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorodifluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorodifluoromethane	n/a	BDL	
Methylenechloride	n/a	12	14
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

HydroLogic Mobile Laboratory
Analytical Results - Volatile Organic Compounds
Memphis Naval Air Station

Sample Location: 062G006038
Lab File ID: NAS118.001
Calibration Std.: vc0522.001

Date: 05/22/95
Blank: blk0522.001

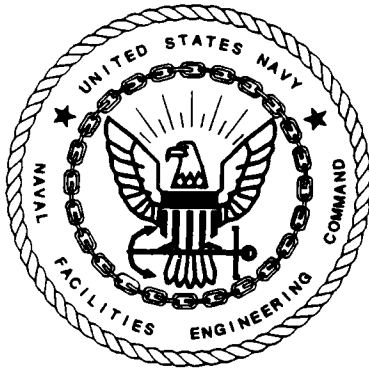
Dilution: 1

Compound	Concen. PID (ppb)	Concen. Hall (ppb)	Blank Concen.
Vinyl Chloride	BDL	BDL	
1,1-Dichloroethene	BDL	BDL	
t-1,2-Dichloroethene	BDL	BDL	
c-1,2-Dichloroethene	BDL	BDL	
1,1-Dichloropropene	BDL	BDL	
Benzene	BDL	n/a	
Trichloroethene	BDL	BDL	
c-1,3-Dichloropropene	BDL	BDL	
t-1,3-Dichloropropene	BDL	BDL	
Toluene	BDL	n/a	
Tetrachloroethene	BDL	BDL	
Chlorobenzene	BDL	BDL	
Ethylbenzene	BDL	n/a	
m,p-Xylenes	BDL	n/a	
Styrene	BDL	n/a	
o-Xylene	BDL	n/a	
BFB (surrogate)	77.5	87.8	
40,42	BDL	n/a	
n-Propylbenzene	BDL	n/a	
2-Chlorotoluene	BDL	BDL	
4-Chlorotoluene	BDL	BDL	
1,3,5-Trimethylbenzene	BDL	n/a	
t-Butylbenzene	BDL	n/a	
1,2,4-Trimethylbenzene	BDL	n/a	
s-butylbenzene/1,3-DCB	BDL	n/a	
1,4-Dichlorobenzene	BDL	BDL	
p-Isopropyltoluene	BDL	n/a	
1,2-Dichlorobenzene	BDL	BDL	
n-Butylbenzene	BDL	n/a	
1,2,4-Trichlorobenzene	BDL	BDL	
Naphthalene	BDL	n/a	
Hexachlorobutadiene	BDL	BDL	
1,2,3-Trichlorobenzene	BDL	BDL	
Dichlorofluoromethane	n/a	BDL	
Bromomethane	n/a	BDL	
Chloroethane	n/a	BDL	
Trichlorofluoromethane	n/a	BDL	
Methylenechloride	n/a	5	14
1,1-Dichloroethane	n/a	BDL	
Bromochloromethane	n/a	BDL	
Chloroform	n/a	BDL	
2,2-Dichloropropane	n/a	BDL	
1,2-Dichloroethane	n/a	BDL	
1,1,1-Trichloroethane	n/a	BDL	
Carbon Tetrachloride	n/a	BDL	
Dibromomethane	n/a	BDL	
1,2-Dichloropropane	n/a	BDL	
Trichloroethene	n/a	BDL	
Bromodichloromethane	n/a	BDL	
1,1,2-Trichloroethane	n/a	BDL	
1,3-Dichloropropene	n/a	BDL	
Dibromochloromethane	n/a	BDL	
1,2-dibromomethane	n/a	BDL	
1,1,1,2-Tetrachloroethane	n/a	BDL	
Bromoform	n/a	BDL	
41,43	n/a	BDL	
1,2-Dibromo-3-chloropropene	n/a	BDL	

Attachment 1

Data Validation Report

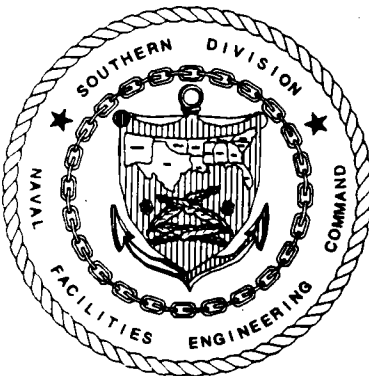
**CONFIRMATORY SAMPLING INVESTIGATION
DATA VALIDATION REPORT — ASSEMBLY C
NAVAL SUPPORT ACTIVITY MEMPHIS
MILLINGTON, TENNESSEE**



**CTO-094
Contract No: N62467-89-D-0318**

Prepared for:

**Department of the Navy
Southern Division
Naval Facilities Engineering Command
North Charleston, South Carolina**



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May 24, 1996

Table of Contents

1.0	INTRODUCTION	1
1.1	Organic Evaluation Criteria	3
1.1.1	Holding Times	5
1.1.2	GC/MS Mass Calibration (Instrument Performance Checks)	5
1.1.3	Surrogate Spike Recoveries	5
1.1.4	Instrument Calibration	6
1.1.5	Matrix Spikes/Matrix Spike Duplicates	7
1.1.6	Laboratory Control Samples and Laboratory Duplicates	8
1.1.7	Blank Analysis	8
1.1.8	Internal Standard Performance	10
1.1.9	Field Duplicate Precision	10
1.2	Inorganic Evaluation Criteria	11
1.2.1	Holding Times	12
1.2.2	Instrument Calibration	13
1.2.3	Blank Analysis	13
1.2.4	ICP Interference Check Samples	14
1.2.5	Laboratory Control Samples	14
1.2.6	MS Analysis	14
1.2.7	Laboratory Duplicates	14
1.2.8	ICP Serial Dilutions	15
1.2.9	AA Duplicate Injections and Postdigestion Spike Recoveries	15
1.2.10	Field Duplicate Precision	15
2.0	DATA VALIDATION RESULTS — SWMU 26	15
2.1	Data Quality	16
2.2	Blanks	17
2.3	Unusable Data	17
3.0	DATA VALIDATION RESULTS — SWMU 27	17
3.1	Data Quality	19
3.2	Unusable Data	19
3.3	Blanks	19
4.0	DATA VALIDATION RESULTS — SWMU 62	20
4.1	Data Quality	20
4.2	Blanks	21

List of Tables

Table 1-1	NSA Memphis Analytical Program	1
Table 2-1	SWMU 26 Sample IDs	16
Table 2-2	SWMU 26 Unusable Data	17
Table 3-1	SWMU 27 Sample IDs	17
Table 3-2	SWMU 27 Unusable Data	19
Table 4-1	SWMU 62 Sample IDs	20

List of Attachments

Attachment A	Data Validation Summary Narratives and Data Tables
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1.0 INTRODUCTION

This report presents the analytical data collected during the Confirmatory Sampling Investigation of Naval Support Activity (NSA) Memphis Assembly C Solid Waste Management Units (SWMUs) 26, 27, and 62 and the quality assurance/quality control (QA/QC) evaluation of those data. The purpose of the data evaluation is to verify that the QC requirements of the data set have been met and to characterize the weakness of any questionable data.

The Assembly C soil and groundwater samples were collected at NSA Memphis during May and June 1995, and February and March 1996; submitted to National Environmental Testing, Inc., laboratory in Bedford, Massachusetts; and reported using U.S. Environmental Protection Agency (USEPA) Data Quality Objectives (DQO) Level III and IV equivalents. The analytical methods and DQO laboratory deliverables are summarized in Table 1-1.

Table 1-1
NSA Memphis Analytical Program

Analytical Method	Data Quality Level	Method Reference	Site
Full Scan			
Volatile Organic Compounds	IV	SW-846 8240	SWMUs 27, 62
Semivolatile Organic Compounds	IV	SW-846 8270	SWMUs 26, 27, 62
Pesticide/Polychlorinated biphenyls	IV	SW-846 8080	SWMUs 26, 27, 62
Metals	IV	40 CFR Part 264 Appendix IX (SW-846 6010/7060/7421/7471/7740/7841)	SWMUs 26, 27, 62

Note:

CFR = Code of Federal Regulations

The references for the methods listed in Table 1-1 were obtained from the following sources:

- USEPA Office of Solid Waste and Emergency Response (OSWER), *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846), Third Edition, revised July 1992.

- USEPA Environmental Monitoring and Support Laboratory, *Methods for Chemical Analysis of Water and Wastes* (EPA-600/4-79-020, revised March 1983).
- USEPA Title 40 Code of Federal Regulations Part 264, Appendix IX (52 Federal Register 25947, July 1987).

Data were validated using the following documents (as appropriate):

- *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*, February 1994 (EPA-540/R-94/012). OSWER.
- *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, February 1994, (EPA-540/R-94/013). OSWER.

The NSA Memphis data were validated by either EnSafe/Allen and Hoshall (E/A&H) or E/A&H's subcontractors, Validata Chemical Services of Norcross, Georgia, or Heartland Environmental Services, Inc., of St. Charles, Missouri. The data were validated at DQO Level III. The data validation findings were summarized separately for each sample delivery group (SDG). Each SDG usually contained 20 samples of one matrix type, i.e., either a solid (soil and/or sediment) or water (groundwater and/or surface water) samples, except for QC samples. The validation summary reports and data summary tables are included in Attachment A to this document.

The following sections discuss the significant data validation findings for each SWMU. The following outlines the SWMUs for this project and the analytical parameters associated with each.

Data Validation Summary of the Investigative Samples:

Section 2	Organic and Metals Data	SWMU 26
Section 3	Organic and Metals Data	SWMU 27
Section 4	Organic and Metals Data	SWMU 62

1.1 Organic Evaluation Criteria

The USEPA methods described in the following define QC criteria that the laboratory must meet but the methods do not address data evaluation from a user's perspective:

- *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*
- *Methods for Chemical Analysis of Water and Wastes.*

Evaluation criteria are available in *USEPA Contract Laboratory National Functional Guidelines for Organic Data Review* (Organic Functional Guidelines), February 1994, which was used throughout the data evaluation process when the analytical methods did not address data usability.

Data evaluation for samples collected at NSA Memphis included the following parameters:

- Holding times
- Gas chromatograph/mass spectrometry (GC/MS) instrument performance checks
- Surrogate spike recoveries
- Instrument calibration
- Matrix spike and matrix spike duplicates (MS/MSD)
- Blank analysis
- Internal standard performance
- Compound quantitation
- Field duplicate precision

According to Organic Functional Guidelines, when the QC parameters do not fall within the specific method guidelines, the data evaluator annotates or "flags" the corresponding compounds where deficiencies were found. The data from NSA Memphis were evaluated using this approach. The following flags were used to annotate data with laboratory and/or field deficiencies or problems:

- U Undetected** — The analyte was analyzed for but not detected or was also found in an associated blank, but at a concentration less than 10 times the blank concentration for common laboratory constituents (contaminants) or five times the blank concentration for other constituents; the associated value shown is the Practical Quantitation Limit (PQL).
 - J Estimated Value** — One or more QC parameters were outside control limits or the concentration of the analyte was less than the PQL.
 - UJ Undetected and Estimated** — The analyte was analyzed for but not detected above the listed estimated quantitation limit; the quantitation limit is estimated because at least one QC parameter was outside control limits.
 - D Diluted Result** — The compound was reanalyzed at a secondary dilution factor. If at least one compound was outside the calibration range during an initial analysis, the laboratory flags the analyte "E." When diluted, the sample results will be flagged "D." Generally, values from the initial analysis will be used except where the value exceeded the calibration range. Values exceeding the calibration range in the initial analysis will be substituted by the diluted value to ensure the most representative data. The "D" flag will remain on the value to alert the data user that the secondary dilution value was used.
- R/UR Unusable Data** — At least one QC parameter grossly exceeded control limits.

These validation flags were applied to data where data deficiencies were noted. Attachment A includes tables of all qualified data.

1.1.1 Holding Times

Acceptable technical holding times are specified in the analytical methods. The sample holding time depends on the type of analysis and whether the sample was preserved. For water samples, the holding time for preserved volatile organic compound (VOC) analysis is 14 days from the collection date. Semivolatile organic compound (SVOC) and pesticide/polychlorinated biphenyl (PCB) water samples must be extracted within seven days and analyzed within 40 days after extraction. Holding times for soil matrices are not specified in SW-846. Therefore, data reviewers can apply the water sample holding times criteria to soil at their discretion.

1.1.2 GC/MS Mass Calibration (Instrument Performance Checks)

Tuning and performance criteria are established to ensure that the data produced by the instrument may be correctly interpreted according to the requirements of the method being used. These criteria are not sample specific; conformance is determined using standard materials. Therefore, these criteria must be met in all circumstances. The performance standards for VOC (bromofluorobenzene [BFB]) and SVOC (decafluorotriphenylphosphine [DFTPP]) analyses are evaluated to determine if the data produced by the instrument may be correctly interpreted according to the method requirements. Performance standards must be analyzed within 12 hours of sample analysis, and the results must be within the established criteria.

1.1.3 Surrogate Spike Recoveries

Surrogate compounds are added to samples and laboratory blanks before extraction and sample preparation to evaluate the effect of the sample matrix on extraction and measurement procedures. Surrogates are organic compounds which are chemically similar to analytes of interest but not normally found in environmental samples. Three surrogate compounds are added to samples for VOC analysis, eight are added to samples for SVOC analysis, and two are added

to pesticide/PCB samples. Percent recovery (%R) of the surrogates is calculated by comparing the amount of the compound recovered by the analysis to the amount added to the sample.

Below is a list of surrogate compounds recommended by the SW-846 methods.

VOC Surrogates

Toluene-d8 (TOL)

BFB

1,2-Dichloroethane (DCE)

Pesticide/PCB Surrogates

Tetrachloro-m-xylene (TCMX)

Decachlorobiphenyl (DCB)

SVOC Surrogates

Nitrobenzene-d5 (NBZ)

2-Fluorobiphenyl (FBP)

Terphenyl-d14 (TPH)

2,4,6-Tribromophenol (TBP)

Phenol-d5 (PHL)

2-Chlorophenol-d4 (2CP)

1,2-Dichlorobenzene-d4 (DCB)

1.1.4 Instrument Calibration

Instruments are initially and continually calibrated with standard solutions to verify that they are capable of producing acceptable quantitative data for the compounds.

Initial calibration (GC/MS): The instrument is initially calibrated at the beginning of the analytical run to check its performance and to establish a linear five-point calibration curve. The initial calibration is verified by calculating the relative response factor (RRF) and the percent relative standard deviation (%RSD) for each compound. An RRF less than 0.05 or a %RSD greater than 30% is outside the QC limits for the initial calibration.

Continuing calibration (GC/MS): Standard solutions are run periodically to check the daily performance of the instrument and to establish the 12-hour RRF on which the sample quantitations are based. The continuing calibration is verified by calculating the RRF and the

percent difference (%D) for each compound. An RRF less than 0.05 or a %D greater than 25 % is outside the QC limits for the continuing calibration.

Initial calibration (GC): For single-component pesticides, two separate standard mixes are used, five-point calibrations are analyzed, and calibration factors (CF) are established. The CF for single-component pesticides must be less than or equal to 20%.

The multicomponent pesticide toxaphene and all PCBs (or Aroclors) are analyzed separately. Retention times and CFs are determined for three to five primary peaks. The only review criteria for multicomponent compounds is to verify these steps were taken.

Continuing calibration (GC): To confirm the calibration and evaluate instrument performance for single-component pesticides, calibration verification consisting of instrument blank, performance evaluation mixtures, and the midpoint concentration of the two standard mixes are analyzed. The %D between the calculated amount and the true amount must not exceed 15% on the primary column.

Multicomponent compounds do not require continuing calibration.

1.1.5 Matrix Spikes/Matrix Spike Duplicates

The MS, which is used to determine the accuracy of the analysis for a given matrix, consists of a known quantity of stock solution added to the sample before its preparation and analysis. Evaluating the MS data involves two calculations. First, the is calculated by comparing the amount of the compound recovered by the analysis to the amount added to the sample. In addition, the relative percent difference (RPD) between the MS and the MSD samples is calculated and assessed. No specific requirements have been established for qualifying MS/MSD data. However, guidelines to aid in applying professional judgment are discussed in Organic Functional Guidelines.

1.1.6 Laboratory Control Samples and Laboratory Duplicates

Some GC methods may require that a laboratory control sample (LCS) and laboratory duplicate analysis be performed with each SDG. The LCS monitors the overall performance of each step during analysis, including sample preparation. All aqueous LCS %R results must fall within the control limits established by the laboratory. Laboratory duplicate samples are used to demonstrate acceptable method precision at the time of analysis. The RPD between the sample and the duplicate sample is calculated. Although no guidelines are established for organic laboratory duplicates, sample qualification is left up to professional judgment.

1.1.7 Blank Analysis

Laboratory method blanks are used to assess the existence and magnitude of potential contamination introduced during analysis. Additionally, *field blanks* may be collected to assess any contamination introduced while collecting samples. When chemicals are found both in samples and laboratory blanks analyzed within the same 12-hour period **and/or** field-derived blanks, the usability of the data depends on the reviewer's judgment and the blank's origin. According to Organic Functional Guidelines, a sample result should not be considered positive unless the concentration of the compound in the sample exceeds 10 times the amount in **any** blank for common laboratory contaminants (i.e., methylene chloride, acetone, 2-butanone, and common phthalate esters), or five times the amount for other constituents. These amounts are referred to as *action levels* (ALs). Because blank samples may not be prepared using the same weight, dilution or volume of sample, these factors also should be considered when using these blank criteria. The specific actions to be taken are as follows:

- If a chemical is found in the blank but not the sample, no action is taken.
- If the sample concentration is less than the quantitation limit and less than the AL, the quantitation limit is reported.

- If the sample concentration is between the quantitation limit and the AL, the concentration is reported as nondetect "U."
- If the sample concentration is greater than the AL, the concentration may be used unqualified.

Field-Derived Blanks

For this project, three types of field-derived blanks were collected: the *field blank*, the *equipment rinsate blank* (also called a *rinsate blank*), and the *trip blank*. The field blank is a sample of the source water used onsite, primarily to decontaminate equipment. The equipment rinsate blank is a sample of runoff water from one or more pieces of the decontaminated equipment used to collect samples. The trip blank is a 40-milliliter volatile organic analysis (VOA) vial filled at the laboratory with certifiable water to assess cross-contamination during VOC sample container shipment and handling both before and after the samples are collected.

The frequencies for collecting these QC samples were defined in Section 4 of the *NSA Memphis Comprehensive RFI Work Plan* (E/A&H, October 1994) as follows:

- *Field blanks* — one per source of water per sampling event.
- *Rinsate blank* — one per week.
- *Trip blank* — one per shipment containing samples for VOAs.

For data validation, each trip blank is associated only with the samples from the same shipment/cooler. The field blanks and the rinsate blanks apply to a larger number of samples because only one is collected per sampling event. Because field-derived blanks are used with method blanks to assess potential cross-contamination of field investigative samples, no action was taken if contamination was detected in the method blanks associated with the field-derived

blanks. Most rinsate and field blanks collected for Assembly C were sent to the onsite laboratory during direct push technology (DPT) work.

1.1.8 Internal Standard Performance

GC/MS internal standards are added to samples to ensure the stability of the instrument's sensitivity and response during each analytical VOC and SVOC run. Internal Standard area counts for samples and blanks must not vary more than a factor of two (-50% to +100%) from the associated calibration standard. If an Internal Standard area count is outside this window, action should be taken.

Listed below are the internal standard compounds recommended by the methods.

VOC Compounds

Bromochloromethane (BCM)
1,4-Difluorobenzene (DFB)
Chlorobenzene-d5 (CBZ)

SVOC Compounds

1,4-Dichlorobenzene-d4 (DCB)
Naphthalene-d8 (NPT)
Acenaphthene-d10 (ANT)
Phenanthrene-d10 (PHN)
Chrysene-d12 (CRY)
Perylene-d12 (PRY)

1.1.9 Field Duplicate Precision

One field duplicate was collected at NSA Memphis for each 10 water and/or soil or sediment samples collected. Field duplicate samples are analyzed to evaluate data precision, which measures the reproducibility of the analysis.

For the NSA Memphis Resource Conservation and Recovery Act Facility Investigation (RFI), RPDs between the samples and duplicates were calculated during the validation processes for sample results above the PQL. If the results for any compounds did not meet RPD criteria of

less than 30% for water and less than 50% (Validata used a control limit of 60%) for soil or sediment, the positive results for that compound were flagged as estimated for the sample and duplicate only. If one value was nondetected and the other value was above the PQL, the positive result was flagged as estimated "J," and the nondetected result as estimated "UJ."

1.2 Inorganic Evaluation Criteria

The USEPA methods described in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* and *Title 40 Code of Federal Regulations Part 264, Appendix IX* define QC criteria that the laboratory must meet, but the methods do not address data evaluation from a user's perspective. Evaluation criteria are available in *USEPA Contract Laboratory National Functional Guidelines for Inorganic Data Review* (Inorganic Functional Guidelines), February 1994, which was used throughout the data evaluation process when the analytical methods did not address data usability.

Data evaluation for samples collected at NSA Memphis included the following parameters:

- Holding times
- Instrument calibration
- MS results
- Laboratory duplicates
- Blank analysis
- Inductively Coupled Plasma (ICP) interference check samples
- ICP serial dilutions
- LCS results
- Atomic Absorption (AA) duplicate injections and postdigestion spike recoveries
- Field duplicate precision

According to Inorganic Functional Guidelines, when the QC parameters do not fall within the specific method guidelines, the data evaluator annotates or "flags" the corresponding deficient compounds. The data from NSA Memphis were evaluated using this approach. The following flags were used to annotate data exhibiting laboratory and/or field deficiencies or problems:

U Undetected — The analyte was analyzed for but not detected above the instrument detection limit (IDL) or was also found in an associated blank at a concentration less than five times the blank concentration. The IDL is described as the lowest possible concentration an instrument can detect a particular analyte.

J Estimated Value — At least one QC parameter was outside control limits or the analyte's concentration was less than the PQL.

UJ Undetected and Estimated — The analyte was analyzed for but not detected above the listed estimated IDL; the IDL is estimated because at least one QC parameter was outside control limits.

R/UR Unusable Data — One or more QC parameters grossly exceeded control limits.

1.2.1 Holding Times

Acceptable technical holding times are specified in the analytical methods. For aqueous samples, the holding time for metals analysis is six months, except for mercury, which is 28 days from the date of collection. Holding times for soil matrices are not specified in the methods. Therefore, data reviewers may apply the water sample holding times criteria to soil at their discretion.

1.2.2 Instrument Calibration

Initial and continuing calibrations of the instruments with standard solutions are used to check that the instrument is capable of producing acceptable qualitative and quantitative data for the analytes on the Appendix IX list.

An initial calibration is performed to check the performance of the instrument at the beginning of the analytical run and to establish a linear calibration curve. Calibration standard solutions are analyzed periodically to check the instrument performance and confirm that the initial calibration curve is still valid. Calibrations are verified by calculating the %R and comparing the amount of the analyte recovered by analysis to the known amount of standard. The %R for metals, except for mercury, should fall between 90% and 110%. The %R for mercury should fall between 80% and 120%.

1.2.3 Blank Analysis

Laboratory method blanks are used to assess the existence and magnitude of potential contamination introduced during analysis. Additionally, *field blanks* may be collected to assess the potential contamination introduced during sample collection. When chemicals are found in samples and laboratory blanks, the usability of the data depends on the reviewer's judgment and the blank's origin. According to Inorganic Functional Guidelines, a sample result should not be considered positive unless the concentration of the compound in the sample exceeds five times the amount in **any** blank, referred to as ALs. Because blank samples may not be prepared using the same weight, dilution or volume of sample, these factors also should be considered when using these blank criteria. The specific actions to be taken are as follows:

- If a chemical is found in the blank but not the sample, no action is taken.
- If the sample concentration is between the IDL, and less than the AL, the concentration is reported as "U."

- If the sample concentration is greater than the AL, the concentration may be used unqualified.

1.2.4 ICP Interference Check Samples

The ICP interference check sample is used to confirm the laboratory instrument's inter-element and background correction factors. Interference samples should be run at the beginning and end of each sample analysis run or at least twice per eight-hour working shift. The percent recoveries for the interference check sample should fall between 80% and 120%.

1.2.5 Laboratory Control Samples

LCSs are used to monitor the overall performance of steps in the analysis, including the sample preparation. All aqueous LCS percent recovery results must fall within the control limits of 80% to 120%, except for antimony and silver for which control limits have not been established. Soil LCS standards are generally provided by the USEPA (or state agency or private laboratory). Control limits are established for each soil LCS standard prepared.

1.2.6 MS Analysis

Samples are spiked with known quantities of analytes to evaluate the effect of the sample matrix on digestion and measurement procedures. The %R should be within 75% to 125%. However, when the sample concentration exceeds the spike concentration by a factor of four or more, spike recovery criteria are not applicable.

1.2.7 Laboratory Duplicates

Laboratory duplicate samples are analyzed to evaluate data precision, a measure of the reproducibility of the analysis. The RPD between the sample and the duplicate sample is calculated. A control limit of 20 RPD for aqueous samples and 35% for soil or sediment samples should not be exceeded for analyte values greater than the quantitation limit or two times the quantitation limit, respectively.

1.2.8 ICP Serial Dilutions

ICP serial dilutions assess the absence or presence of matrix interference. One sample from each set of similar matrix type is chosen for the serial dilution (a five-fold dilution). For an analyte concentration that is at least a factor of 10 times above the instrument detection limit, the measured concentrations of the undiluted sample and of the diluted sample should agree within 10%.

1.2.9 AA Duplicate Injections and Postdigestion Spike Recoveries

During AA analysis, duplicate injections and postdigestion spikes are used to assess precision and accuracy of the laboratory analysis. The %RSD of duplicate injections must agree within 20%. Percent recovery of the postdigestion spike sample should fall between 85% and 115%.

1.2.10 Field Duplicate Precision

One field duplicate was collected for each 10 water and/or soil samples collected. Field duplicate samples are analyzed to evaluate data precision, which is a measure of the reproducibility of the analysis.

For the NSA Memphis RFI, RPDs between the samples and duplicates were calculated during the validation processes for sample results above the PQL. If the results for any compounds did not meet RPD criteria of less than 30% for water and less than 50% (Validata used a control limit of 60%) for soil or sediment, the positive results for that compound were flagged as estimated for the sample and duplicate only. If one value was nondetected and the other value was above the PQL, the positive result was flagged as estimated "J," and the nondetected result as estimated "UJ."

2.0 DATA VALIDATION RESULTS — SWMU 26

All samples were received by the laboratory intact and with the proper documentation. Table 2-1 summarizes the samples that were included in SWMU 26.

**Table 2-1
SWMU 26 Sample IDs**

Sample IDs	SVOCs	Pest/PCBs	Appendix IX Metals	Arsenic, Cadmium, Nickel, Lead, Mercury, & Zinc
026S000104				X
026S000108				X
026S000118				X
026S000204				X
026S000208				X
026S000218				X
026S000304				X
026S000308				X
026S000318				X
026S000404				X
026S000408				X
026S000415				X
026S000501	X	X	X	

Thirteen investigative samples were analyzed in two SDGs for SWMU 26. Full validation reports of each SDG and data tables can be found in Attachment A.

2.1 Data Quality

The overall data quality of the analytical work performed for NSA Memphis at SWMU 26 was considered satisfactory and usable for site remediation and risk assessment. Results that were outside QA/QC requirements were flagged as estimated "J," indicating that the data could be biased either high or low. Although the data are qualified as estimated, they remain dependable for use in risk assessment and site remediation.

2.2 Blanks

Arsenic, barium, cadmium, copper, lead, and zinc were detected in several method blanks. The blanks were examined during the validation process and sample results for arsenic, barium, cadmium, copper, lead, and zinc believed to be from blank contamination were nullified.

2.3 Unusable Data

One element in one sample was rendered unusable because it grossly exceeded a QC parameter. Table 2-2 summarizes the unusable data and explains the qualification.

**Table 2-2
SWMU 26 Unusable Data**

Sample ID	Fraction	Analyte(s)	Reason
026S000501	Metals	Antimony	MS percent recovery

3.0 DATA VALIDATION RESULTS — SWMU 27

All samples were received by the laboratory intact and with the proper documentation. Table 3-1 summarizes the samples that were included in SWMU 27.

**Table 3-1
SWMU 27 Sample IDs**

Sample IDs	VOC	SVOC	Pest/PCB	APP IX Metals
027S000101		X	X	X
027S000105				X
027S000114				X
027S000201		X	X	X
027S000206				X
027S000212				X
027S000301				X

**Table 3-1
SWMU 27 Sample IDs**

Sample IDs	VOC	SVOC	Pest/PCB	APP IX Metals
027S000306				X
027S000312				X
027S000401				X
027S000406				X
027S000412				X
027S000501		X	X	X
027S000506				X
027S000512				X
027C000512	X			X
027H000545	X			
027S000601				X
027S000606				X
027S000612				X
027S000701				X
027S000706				X
027S000712				X
027S000801				X
027S000806				X
027C000806	X			X
027S000812				X
027C000812	X			X
027S000901				X
027S000906				X
027S000912				X
027H000944	X			

Thirty-two investigative samples were analyzed in four SDGs for SWMU 27. Full validation reports of each SDG and data tables can be found in Attachment A of this document.

3.1 Data Quality

The overall data quality of the analytical work performed for NSA Memphis at SWMU 27 was considered satisfactory and usable for site remediation and risk assessment. Results that were outside QA/QC requirements were flagged as estimated "J," indicating that the data could be biased either high or low.

3.2 Unusable Data

Three elements in 21 samples were rendered unusable because they grossly exceeded QC parameters. Table 3-2 summarizes the unusable data and explains the qualification.

**Table 3-2
SWMU 27 Unusable Data**

Sample ID	Fraction	Analyte(s)	Reason
027S000301 027S000306 027S000312 027S000406 027S000412 027S000506 027S000512 027C000512 027S000601 027S000606 027S000612 027S000706	Metals	Silver Selenium	MS percent recovery
027S000712 027S000801 027S000806 027C000806	Metals	Silver Selenium	MS percent recovery
027S000401 027S000501 027S000701	Metals	Selenium	MS percent recovery
027S000114 027S000212	Metals	Antimony	MS percent recovery

3.3 Blanks

Methylene chloride, arsenic, selenium, antimony, silver, cobalt, copper, cadmium, chromium, thallium, tin, and zinc were detected in several method and field blanks. The blanks were

examined during the validation process and sample results for methylene chloride, arsenic, selenium, antimony, silver, cobalt, copper, cadmium, chromium, thallium, tin, and zinc believed to be from blank contamination were nullified.

4.0 DATA VALIDATION RESULTS — SWMU 62

All samples were received by the laboratory intact and with the proper documentation. Table 4-1 summarizes the samples that were included in SWMU 62.

**Table 4-1
SWMU 62 Sample IDs**

Sample IDs	SVOCs	Pest/PCBs	Appendix IX Metals	VOC
062C002020				X
062C005020				X
062H005041				X
062C006020				X
062S000701	X	X	X	
062S000801	X	X	X	
062S000901	X	X	X	

Seven investigative samples were analyzed in two SDGs for SWMU 62. Full validation reports of each SDG and data tables can be found in Attachment A.

4.1 Data Quality

The overall data quality of the analytical work performed for NSA Memphis at SWMU 62 was considered satisfactory and usable for site remediation and risk assessment. Results that were outside QA/QC requirements were flagged as estimated "J," indicating that the data could be

biased either high or low. Although the data are qualified as estimated, they remain dependable for use in risk assessment and site remediation.

4.2 Blanks

Acetone and methylene chloride were detected in several method blanks. The blanks were examined during the validation process and sample results for acetone and methylene chloride believed to be from blank contamination were nullified.

Attachment A
Data Validation Summary Narratives
and
Data Tables

SWMU 26

DATA QUALIFICATION SUMMARY

NET, Inc. - 1439 Inorganics

SAMPLES: 026S000104, 026S000104MS, 026S000104MD, 026S000108, 026S000118, 026S000204, 026S000208, 026S000218, 026S000304, 026S000308, 026S000318, 026S000404, 026S000408, 026S000415

TOTAL METALS

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Calibration criteria were met. No action was required.

III.) Blanks:

The following blank result represents the highest detection associated with the samples and was used for data qualification:

<u>Blank</u>			<u>Action Level</u>
<u>Type/ID#</u>	<u>Analyte</u>	<u>Max. Conc.</u>	<u>mg/kg</u>
CCB2	arsenic	3.80 ug/L	3.80

CCB = Continuing Calibration Blank

All results greater than the IDL but less than 5X the blank amount (Action Level, mg/kg for soil samples) for which the contaminated blank was an associated calibration blank were flagged as undetected (U).

The following analytes had negative results with absolute values greater than the IDL's:

<u>Blank</u>			
<u>Type/ID#</u>	<u>Analyte</u>	<u>Neg. Conc.</u>	<u>5X Conc. (mg/kg)</u>
CCB4	cadmium	-4.30 ug/L	4.30
CCB2	zinc	-6.20 ug/L	6.20

CCB = Continuing Calibration Blank

All associated positive sample results less than 5X the absolute value of the negative blank results were flagged as estimated (J) and all non-detects were flagged as estimated (UJ).

IV.) ICP Interference Check Sample Results:

All Interference Check Sample criteria were met. No action was required.

V.) ICP Serial Dilution Analysis:

All Serial Dilution criteria were met, so no action was necessary.

VI.) Laboratory Control Samples (LCS):

All Laboratory Control Sample criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

The Relative Percent Difference (RPD) of nickel (54.9%) exceeded the 35% QC limits for soil duplicate sample 026S000104MD. The results for this analyte in the samples of this SDG, which consisted entirely of positive detections, were flagged as estimated (J).

VIII.) Matrix Spike Recoveries:

The Percent Recovery (%R) of arsenic (70.4%) was below the 75-125% QC limit for sample 026S000104MS. The positive and non-detect results for this analyte in the samples of this SDG were flagged as estimated (J) and (UJ).

IX.) Field Duplicates:

There were no field duplicate samples associated with this SDG. No action was required.

X.) Furnace Atomic Absorption QC:

Method of Standard Additions (MSA):

The MSA coefficient of correlation was less than 0.995 for arsenic in the following samples:

<u>Client</u>	<u>Coeffecient of</u>
<u>Sample #:</u>	<u>Correlation:</u>
026S000104	0.968
026S000204	0.986
026S000208	0.949
026S000304	0.935
026S000308	0.944

All positive and non-detect results for arsenic in these samples were previously flagged as estimated (J) and (UJ) based on blank contamination or low matrix spike recoveries. No further action was necessary.

Post Digestion Spike Recoveries:

All Post Digestion Spike Recovery criteria were met. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met, so no action was taken.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualification.

E/A&H VALIDATION SUMMARY REPORT

Site Name: NSA Memphis, Millington, Tennessee
CTO and Subtask No.: 0094-04730
Laboratory: NET, Bedford
Sample Delivery Group: 1719
Matrix: Soil

SDG 1719 Sample ID and Analyses

Sample ID	Appendix 9 Metals	SVOCs	Pest/PCBs
026S000501	X	X	X

VALIDATION RESULTS

All samples were received by the laboratory intact and with the proper documentation on March 7, 1996, for metals, SVOCs, and pest/PCBs. The following sections summarize the data validation results.

Appendix IX Metals Fraction

1. All holding times, initial calibration verifications, continuing calibration verifications, ICP interference check sample recoveries, LCSs, ICP serial dilution differences, and graphite furnace atomic absorption (GFAA) analytical spike results were acceptable. No problems were encountered during review of sample result verification.
2. The following elements were detected in the various blanks analyzed with this SDG.

Blank Detections and Associated Samples

Blank ID	Element	Conc.	Action Level	Associated Samples
CCB1	Chromium	5.0 µg/L	5.0 mg/kg	026S000501
	Vanadium	4.1 µg/L	4.1 mg/kg	
	Tin	49.6 µg/L	49.6 mg/kg	
CCB2	Cadmium	3.6 µg/L	3.6 mg/kg	026S000501
	Vanadium	7.2 µg/L	14.4 mg/kg	
	Zinc	8.7 µg/L	8.7 mg/kg	
	Tin	62.7 µg/L	62.7 mg/kg	
CCB3 (2nd run)	Selenium	2.5 µg/L	2.5 mg/kg	026S000501
CCB4 (2nd run)	Selenium	1.9 µg/L	1.9 mg/kg	026S000501

Blank Detections and Associated Samples

Blank ID	Element	Conc.	Action Level	Associated Samples
Method Blank	Barium	0.584 mg/kg	2.92 mg/kg	026S000501
	Chromium	-1.694 mg/kg	16.94 mg/kg	
	Copper	1.280 mg/kg	6.4 mg/kg	
	Lead	0.570 mg/kg	2.85 mg/kg	
	Silver	-0.826 mg/kg	8.26 mg/kg	
	Vanadium	-2.030 mg/kg	20.3 mg/kg	
	Zinc	-1.262 mg/kg	12.6 mg/kg	

Note: $\mu\text{g/L}$ = micrograms per liter mg/kg = milligrams per kilogram

When the blank concentration was greater than the PQL, the AL was five times the blank concentration. Positive results less than the AL were qualified as nondetect (U); nondetect results were accepted without qualification.

When the blank concentration was less than the PQL (negative result), the AL was 10 times the absolute value of the concentration. Positive results less than the AL were qualified as estimated (J) and nondetect results were qualified as estimated (UJ).

- The following elements exceeded the 75 % to 125 % control limits for the MS.

Matrix Spike Deficiencies

Element	%R	Associated Samples
Antimony	0.0	026S000501
Cadmium	71.6	026S000501

All antimony results were qualified as estimated (J) for positive results and unusable (UR) for undetected results. All cadmium results were qualified as estimated for positive results (J) and undetected results (UJ).

- The RPDs for chromium (38.6) and copper (61.8) exceeded the 20% maximum control limits for laboratory duplicates. All positive results were qualified as estimated (J) while nondetect results were accepted without qualification.

SVOC Fraction

- All holding times, GC/MS instrument performance checks, initial calibrations, continuing calibrations, surrogates recoveries, internal standard performance, and blank results were acceptable. No problems were encountered during review of sample result verification.

Pesticide/PCB Fraction

1. All holding times, surrogate recoveries, blank spike/blank spike duplicate recoveries, blanks, and initial calibrations were acceptable. No problems were encountered during review of sample result verification.
2. The following compounds exceeded the 25 % maximum control limits for the continuing calibration check:

Continuing Calibration Check Deficiencies

Compound	% Difference	Column	Associated Samples
4,4'-DDE	40.1	RXT15	026S000501
Aroclor-1260	27.3	RXT15	026S000501

All results were less than the PQL and therefore were qualified as estimated (UJ).

DATALCP3
05/20/96

NSA MEMPHIS
NAS MEMPHIS, RFI, ASSEMBLY C
SWMU 26

Page: 1
Time: 15:23

APX9-METAL

SAMPLE ID -----> 026-S-0005-01
ORIGINAL ID -----> 026SS80501
LAB SAMPLE ID ----> 143764S
ID FROM REPORT ---> 026SS80501
SAMPLE DATE -----> 03/06/96
MATRIX -----> Soil
UNITS -----> MG/KG

CAS # Parameter

1719

VAL

SB Antimony
AS Arsenic
BA Barium
BE Beryllium
CD Cadmium
CR Chromium
CO Cobalt
CU Copper
PB Lead
HG Mercury
NI Nickel
SE Selenium
AG Silver
TL Thallium
V Vanadium
ZN Zinc
SN Tin

7.3 UR
5.7
82.8
0.53 J
1.2 UJ
15.2 J
8.5 J
15.6 U
19.5
0.12 U
21.8
0.34 U
1.6 J
0.49 U
25.
65.1
28.3 U

*** Validation Complete ***

DATALCP3
05/20/96

NSA MEMPHIS
NAS MEMPHIS, RFI, ASSEMBLY C
SWMU 26

Page: 3
Time: 15:23

RCRA METAL		SAMPLE ID ----->	026-S-0003-04	026-S-0003-08	026-S-0003-18	026-S-0004-04	026-S-0004-08	026-S-0004-15	
		ORIGINAL ID ----->	026S000304	026S000308	026S000318	026S000404	026S000408	026S000415	
		LAB SAMPLE ID ----->	4-124596S	4-124597S	4-124598S	4-124599S	4-124600S	4-124601S	
		ID FROM REPORT -->	026S000304	026S000308	026S000318	026S000404	026S000408	026S000415	
		SAMPLE DATE ----->	06/05/95	06/05/95	06/05/95	06/05/95	06/05/95	06/05/95	
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil	
		UNITS ----->	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	
CAS #	Parameter	1439	VAL	1439	VAL	1439	VAL	1439	VAL
AS	Arsenic	6.6	J	0.49	UJ	1.1	UJ	3.9	J
CD	Cadmium	0.97	J	0.96	J	0.77	J	1.2	J
PB	Lead	5.9		7.4		7.1		5.2	
HG	Mercury	0.12	U	0.12	U	0.12	U	0.12	U
NI	Nickel	18.5	J	15.8	J	11.1	J	16.4	J
ZN	Zinc	34.7		29.		18.		23.8	

*** Validation Complete ***

DATALCP3
05/20/96

NSA MEMPHIS
NAS MEMPHIS, RFI, ASSEMBLY C
SWMU 26

Page: 4
Time: 15:23

SUB46-PEST		SAMPLE ID ----->	026-S-0005-01				
		ORIGINAL ID ----->	026SS80501				
		LAB SAMPLE ID ---->	143764				
		ID FROM REPORT -->	026SS80501				
		SAMPLE DATE ----->	03/06/96				
		DATE EXTRACTED -->	03/11/96				
		DATE ANALYZED ---->	03/15/96				
		MATRIX ----->	Soil				
		UNITS ----->	ug/Kg				
CAS #	Parameter	1719	VAL				
309-00-2	Aldrin	2.	U				
58-89-9	gamma-BHC (Lindane)	2.	U				
319-84-6	alpha-BHC	2.	U				
319-85-7	beta-BHC	2.	U				
319-86-8	delta-BHC	2.	U				
72-54-8	4,4'-DDD	4.1	U				
72-55-9	4,4'-DDE	4.1	UJ				
50-29-3	4,4'-DDT	4.1	U				
60-57-1	Dieldrin	4.1	U				
959-98-8	Endosulfan I	2.	U				
33213-65-9	Endosulfan II	4.1	U				
1031-07-8	Endosulfan sulfate	4.1	U				
72-20-8	Endrin	4.1	U				
7421-93-4	Endrin aldehyde	4.1	U				
76-44-8	Heptachlor	2.	U				
1024-57-3	Heptachlor epoxide	2.	U				
72-43-5	Methoxychlor	20.	U				
8001-35-2	Toxaphene	41.	U				
12674-11-2	Aroclor-1016	41.	U				
11104-28-2	Aroclor-1221	41.	U				
11141-16-5	Aroclor-1232	41.	U				
53469-21-9	Aroclor-1242	41.	U				
12672-29-6	Aroclor-1248	41.	U				
11097-69-1	Aroclor-1254	41.	UJ				
11096-82-5	Aroclor-1260	41.	UJ				
53494-70-5	Endrin ketone	4.1	U				
5103-71-9	alpha-Chlordane	2.	U				
5103-74-2	gamma-Chlordane	2.	U				
12789-03-6	Technical Chlordane	41.	U				

*** Validation Complete ***

DATALCP3
05/20/96

NSA MEMPHIS
NAS MEMPHIS, RFI, ASSEMBLY C
SWMU 26

Page: 5
Time: 15:23

SUB46-SVOA

SAMPLE ID -----> 026-S-0005-01
ORIGINAL ID -----> 026SSB0501
LAB SAMPLE ID ----> 143764
ID FROM REPORT ---> 026ssb0501
SAMPLE DATE -----> 03/06/96
DATE EXTRACTED ---> 03/11/96
DATE ANALYZED ----> 03/12/96
MATRIX -----> Soil
UNITS -----> ug/Kg

CAS #	Parameter	1719	VAL				
108-95-2	Phenol	430.	U				
111-44-4	bis(2-Chloroethyl)ether	430.	U				
95-57-8	2-Chlorophenol	430.	U				
541-73-1	1,3-Dichlorobenzene	430.	U				
106-46-7	1,4-Dichlorobenzene	430.	U				
95-50-1	1,2-Dichlorobenzene	430.	U				
95-48-7	2-Methylphenol (o-Cresol)	430.	U				
108-60-1	2,2'-oxybis(1-Chloropropane)	430.	U				
106-44-5	4-Methylphenol (p-Cresol)	430.	U				
621-64-7	N-Nitroso-di-n-propylamine	430.	U				
67-72-1	Hexachloroethane	430.	U				
98-95-3	Nitrobenzene	430.	U				
78-59-1	Isophorone	430.	U				
88-75-5	2-Nitrophenol	430.	U				
105-67-9	2,4-Dimethylphenol	430.	U				
120-83-2	2,4-Dichlorophenol	430.	U				
120-82-1	1,2,4-Trichlorobenzene	430.	U				
91-20-3	Naphthalene	430.	U				
106-47-8	4-Chloroaniline	430.	U				
87-68-3	Hexachlorobutadiene	430.	U				
111-91-1	bis(2-Chloroethoxy)methane	430.	U				
59-50-7	4-Chloro-3-methylphenol	430.	U				
91-57-6	2-Methylnaphthalene	430.	U				
77-47-4	Hexachlorocyclopentadiene	430.	U				
88-06-2	2,4,6-Trichlorophenol	430.	U				
95-95-4	2,4,5-Trichlorophenol	1100.	U				
91-58-7	2-Chloronaphthalene	430.	U				
88-74-4	2-Nitroaniline	1100.	U				
131-11-3	Dimethyl phthalate	430.	U				
208-96-8	Acenaphthylene	430.	U				
606-20-2	2,6-Dinitrotoluene	430.	U				
99-09-2	3-Nitroaniline	1100.	U				
83-32-9	Acenaphthene	430.	U				
51-28-5	2,4-Dinitrophenol	1100.	U				
100-02-7	4-Nitrophenol	1100.	U				
132-64-9	Dibenzofuran	430.	U				

*** Validation Complete ***

DATALCP3
05/20/96

NSA MEMPHIS
NAS MEMPHIS, RFI, ASSEMBLY C
SWMU 26

Page: 6
Time: 15:23

SUB46-SYOA		SAMPLE ID ----->	026-S-0005-01				
		ORIGINAL ID ----->	026SS80501				
		LAB SAMPLE ID ---->	143764				
		ID FROM REPORT -->	026sab0501				
		SAMPLE DATE ----->	03/06/96				
		DATE EXTRACTED -->	03/11/96				
		DATE ANALYZED ---->	03/12/96				
		MATRIX ----->	Soil				
		UNITS ----->	ug/Kg				
CAS #	Parameter	1719	VAL				
121-14-2	2,4-Dinitrotoluene	430.	U				
84-66-2	Diethylphthalate	430.	U				
7005-72-3	4-Chlorophenylphenylether	430.	U				
86-73-7	Fluorene	430.	U				
100-01-6	4-Nitroaniline	1100.	U				
534-52-1	2-Methyl-4,6-Dinitrophenol	1100.	U				
86-30-6	N-Nitrosodiphenylamine	430.	U				
101-55-3	4-Bromophenyl-phenylether	430.	U				
118-74-1	Hexachlorobenzene	430.	U				
87-86-5	Pentachlorophenol	1100.	U				
85-01-8	Phenanthrene	120.	J				
120-12-7	Anthracene	430.	U				
86-74-8	Carbazole	430.	U				
84-74-2	Di-n-butylphthalate	430.	U				
206-44-0	Fluoranthene	220.	J				
129-00-0	Pyrene	190.	J				
85-68-7	Butylbenzylphthalate	430.	U				
91-94-1	3,3'-Dichlorobenzidine	430.	U				
56-55-3	Benzo(a)anthracene	110.	J				
218-01-9	Chrysene	110.	J				
117-81-7	bis(2-Ethylhexyl)phthalate (BEHP)	61.	J				
117-84-0	Di-n-octyl phthalate	430.	U				
205-99-2	Benzo(b)fluoranthene	110.	J				
207-08-9	Benzo(k)fluoranthene	89.	J				
50-32-8	Benzo(a)pyrene	99.	J				
193-39-5	Indeno(1,2,3-cd)pyrene	48.	J				
53-70-3	Dibenz(a,h)anthracene	430.	U				
191-24-2	Benzo(g,h,i)perylene	51.	J				

*** Validation Complete ***

SWMU 27

DATA QUALIFICATION SUMMARY

NET, Inc. - 1441 Inorganics

SAMPLES: 027S000101, 027S000101MS, 027S000101MD, 027S000105, 027S000114, 027S000201, 027S000206, 027S000212

TOTAL METALS

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Calibration criteria were met. No action was required.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

<u>Blank</u>			<u>Action Level</u>
<u>Type/ID#</u>	<u>Analyte</u>	<u>Max. Conc.</u>	<u>mg/kg</u>
PBS2	antimony	11.3 ug/L	11.3
CCB2	cobalt	4.70 ug/L	4.70
CCB2	copper	5.10 ug/L	5.10
CCB3	silver	4.30 ug/L	4.30

CCB = Continuing Calibration Blank, PBS = Preparation Blank (Soil)

All results greater than the IDL but less than 5X the blank amount (Action Level, mg/kg for soil samples) for which the contaminated blank was an associated calibration or preparation blank were flagged as undetected (U).

The following analytes had negative results with absolute values greater than the IDL's:

<u>Blank</u>			
<u>Type/ID#</u>	<u>Analyte</u>	<u>Neg. Conc.</u>	<u>5X Conc. (mg/kg)</u>
PBS1	cadmium	-0.82 ug/L	0.82
CCB2	thallium	-3.60 ug/L	3.60
CCB2	zinc	-6.90 ug/L	6.90

CCB = Continuing Calibration Blank, PBS = Preparation Blank (Soil)

All associated positive sample results less than 5X the absolute value of the negative blank result were flagged as estimated (J) and all non-detects were flagged as estimated (UJ).

IV.) ICP Interference Check Sample Results:

All Interference Check Sample criteria were met. No action was required.

V.) ICP Serial Dilution Analysis:

All Serial Dilution criteria were met, so no action was necessary.

VI.) Laboratory Control Samples (LCS):

All Laboratory Control Sample criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

All Duplicate Sample criteria were met. No action was necessary.

VIII.) Matrix Spike Recoveries:

The Percent Recoveries (%R's) of the following analytes were below the 75-125% QC limits for spiked sample 027S000101MS:

<u>Analyte</u>	<u>%R</u>
antimony	8.70%
arsenic	61.3%
barium	61.5%
beryllium	64.1%
cadmium	61.5%
chromium	66.2%
cobalt	67.1%
copper	66.4%
nickel	68.5%
silver	65.0%
vanadium	39.3%
tin	68.2%

All non-detect results for antimony in the samples of this SDG were rejected (R) since the %R for this analyte was less than 30%. All positive results for antimony were flagged as estimated (J). All positive and non-detect results for the other analytes in the samples of this SDG were flagged as estimated (J) and (UJ).

IX.) Field Duplicates:

There were no field duplicate samples associated with this SDG. No action was required.

X.) Furnace Atomic Absorption QC:

Method of Standard Additions (MSA):

The MSA coefficient of correlation for arsenic in sample 027S000206 was 0.987, which was less than 0.995. The positive result for arsenic in this sample was previously flagged as estimated (J). No further action was necessary.

Post Digestion Spike Recoveries:

All Post Digestion Spike Recovery criteria were met. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met, so no action was taken.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria met, so no action was taken.

XIII.) Overall Assessment of Data/General:

The non-detect results for antimony were rejected in two samples due to matrix spike recoveries of less than 30%. All remaining laboratory data were acceptable with qualification.

DATA QUALIFICATION SUMMARY

NET, Inc. - 1447 Organics and Inorganics

SAMPLES: 027C000812, 027S000812, 027S000812MS, 027S000812MD, 027S000901, 027S000906,
027S000912, 027H000944, TRIP BLANK

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met. No action was necessary.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviation (%RSD) for acetone (39.0%) exceeded the 30% QC limit for the standards run on 6/07/95 on instrument HO5970L. There was no positive result for this compound in the associated sample, so no action was necessary.

Continuing Calibration:

The Percent Difference (%D) of methylene chloride (26.7%) exceeded the 25% QC limit for the continuing calibration run on 6/13/95 at 10:43 on instrument HP5970K. The non-detect result for this compound in associated sample 027H000944 was flagged as estimated (UJ).

The Percent Differences (%D's) of methylene chloride (26.6%) and carbon tetrachloride (26.1%) exceeded the 25% QC limit for the continuing calibration run on 6/14/95 at 10:16 on instrument HP5970K. The associated sample for this calibration was the trip blank. No action was required.

The Percent Difference (%D) of 1,2-dichloroethene (46.0%) exceeded the 25% QC limit for the continuing calibration run on 6/12/95 at 10:48 on instrument HP5970L. The non-detect result for this compound in associated sample 027C000812 was flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

Methylene chloride was detected at 2.0 ug/L in water method blank VBLK061395K. The positive result for this compound in associated sample 027H000944, which was less than 10X the blank amount, was flagged as undetected (U) with the laboratory result being replaced by the CRQL.

Methylene chloride was detected at 1.0 ug/L in water blank VBLK061495K. The associated sample for this blank was a trip blank. No action was required.

Trip Blank:

Methylene chloride was detected at 4.0 ug/L in the trip blank associated with this SDG. The positive result for this compound in associated sample 027C000812, which was less than 10X the blank amount, was flagged as undetected with the detection limit replacing the analytical result. The result for this compound in the other associated sample (027H000944) was previously flagged based on the associated method blank. No further action was necessary.

TIC's:

There were no TIC's reported in the method blanks or trip blank for this SDG.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

No MS / MSD analysis was requested for this fraction of this SDG. No action was required.

VII.) Field Duplicates:

The field duplicate samples for samples 027C000812 and 027H000944 were not analyzed in this SDG. No action was required.

VIII.) Internal Standards Performance:

All Internal Standards Performance criteria were met. No action was required.

IX.) TCL Compound Identification:

All TCL criteria were met, so no action was necessary.

X.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met. No action was required.

XI.) Tentatively Identified Compounds (TIC's):

All TIC criteria were met, so no action was taken.

XII.) System Performance:

All criteria were met, so no action was necessary.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualification.

TOTAL METALS

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Calibration criteria were met. No action was required.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

<u>Blank</u> <u>Type/ID#</u>	<u>Analyte</u>	<u>Max. Conc.</u>	<u>Action Level</u> <u>mg/kg</u>
CCB3	zinc	12.8 ug/L	12.8
CCB3	tin	23.1 ug/L	23.1

CCB = Continuing Calibration Blank

All results greater than the IDL but less than 5X the blank amount (Action Level, mg/kg for soil samples) for which the contaminated blank was an associated calibration blank were flagged as undetected (U).

The following analytes had negative results with absolute values greater than the IDL's:

<u>Blank</u> <u>Type/ID#</u>	<u>Analyte</u>	<u>Neg. Conc.</u>	<u>5X Conc. (mg/kg)</u>
CCB2	cadmium	-4.20 ug/L	4.20
CCB2	chromium	-6.80 ug/L	6.80
CCB7	thallium	-3.20 ug/L	3.20

CCB = Continuing Calibration Blank

All associated positive sample results less than 5X the absolute value of the negative blank result were flagged as estimated (J) and all non-detects were flagged as estimated (UJ).

IV.) ICP Interference Check Sample Results:

All Interference Check Sample criteria were met. No action was required.

V.) ICP Serial Dilution Analysis:

All Serial Dilution criteria were met, so no action was necessary.

VI.) Laboratory Control Samples (LCS):

All Laboratory Control Sample criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

All Duplicate Sample criteria were met. No action was necessary.

VIII.) Matrix Spike Recoveries:

The Percent Recoveries (%R's) of the following analytes were below the 75-125% QC limits for spiked sample 027S000812MS:

<u>Analyte</u>	<u>%R</u>
antimony	42.5%
selenium	61.7%
thallium	71.6%

All positive and non-detect results for these analytes in the samples of this SDG were flagged as estimated (J) and (UJ).

IX.) Field Duplicates:

The calculable Relative Percent Differences (RPD's) of analytes in field duplicate samples 027S000812 and 027C000812 were:

<u>Analyte</u>	<u>RPD</u>
arsenic	16%
barium	13%
cadmium	27%
chromium	18%
cobalt	1.6%
copper	3.8%
lead	32%
nickel	22%
vanadium	5.4%
zinc	6.8%

All RPD's for these analytes were within the 60% QC limit for soil samples, so no action was necessary.
X.) Furnace Atomic Absorption QC:

Method of Standard Additions (MSA):

All MSA criteria were met. No action was required.

Post Digestion Spike Recoveries:

All Post Digestion Spike Recovery criteria were met. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met, so no action was taken.

XII) Quarterly Verification of Instrumental Parameters:

All criteria met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualification.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422 Norcross, Ga. 30093

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: NAS Memphis
PROJECT NUMBER: 8500.024
CONTRACTED LAB: National Environmental Testing, Inc.
QA/QC LEVEL: Level III
EPA SOW/METHOD: EPA 1990 SOW
VALIDATION GUIDELINES: USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, 1994; USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, 1994
SAMPLE MATRICES: Soil and Water
TYPES OF ANALYSES: Volatile Organics (VOA), Total Metals (Metals)
SDG NUMBER: 1446

SAMPLES:

<u>Client</u>	<u>Lab</u>			
<u>Sample #:</u>	<u>Sample #:</u>	<u>Matrix</u>	<u>VOA</u>	<u>Metals</u>
027S000301	124859	Soil		X
027S000306	124860	Soil		X
027S000312	124861	Soil		X
027S000401	124862	Soil		X
027S000406	124863	Soil		X
027S000412	124864	Soil		X
027S000501	124865	Soil		X
027S000506	124866	Soil		X
027S000512	124867	Soil		X
027C000512	124857	Soil	X	X
027C000512RE	124857RE	Soil	X	
027S000601	124868	Soil		X
027S000606	124869	Soil		X
027S000612	124870	Soil		X
027S000701	124871	Soil		X
027S000706	124872	Soil		X
027S000712	124873	Soil		X
027S000801	124874	Soil		X

<u>Client</u>	<u>Lab</u>			
<u>Sample #:</u>	<u>Sample #:</u>	<u>Matrix</u>	<u>VOA</u>	<u>Metals</u>
027S000806	124875	Soil		X
027C000806	124858	Soil		X
027H000545	124876	Water	X	
027C000806	124858	Soil	X	
027C000806RE	124858RE	Soil	X	
027S000512MS	124867MS	Soil		X
027S000512MD	124867MD	Soil		X

C = FIELD DUPLICATE, H = FIELD DUPLICATE, RE = REANALYSIS, MS = MATRIX SPIKE,
MD = MATRIX DUPLICATE

DATA REVIEWER(S): Amy L. Hogan, Marvin L. Smith

RELEASE SIGNATURE:



Data Qualifier Definitions:

- J - The associated numerical value is an estimated quantity.**
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.**
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.**
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.**

DATA QUALIFICATION SUMMARY

NET, Inc. - 1446 Organics & Inorganics

SAMPLES: 027S000301, 027S000306, 027S000312, 027S000401, 027S000406, 027S000412, 027S000501, 027S000506, 027S000512, 027S000512MS, 027S000512MD, 027C000512, 027C000512RE, 027H000545, 027S000601, 027S000606, 027S000612, 027S000701, 027S000706, 027S000712, 027S000801, 027S000806, 027C000806, 027C000806RE

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met. No action was necessary.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviation (%RSD) for acetone (39.0%) exceeded the 30% QC limit for the standards run on 6/07/95 on instrument HO5970L. The positive result for acetone in sample 027H000545 was flagged as estimated (J).

Continuing Calibration:

The Percent Differences (%D's) of methylene chloride (26.6%) and carbon tetrachloride (26.1%) exceeded the 25% QC limit for the continuing calibration run on 6/14/95 at 10:16 on instrument HP5970K. The non-detect results for these two compounds in sample 027H000545 were flagged as estimated (UJ).

The Percent Difference (%D) of 2-hexanone (25.9%) exceeded the 25% QC limit for the continuing calibration run on 6/13/95 at 09:53 on instrument HP5970L. The non-detect results for this compound in associated samples 027C000512RE and 027C000806 were flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

Methylene chloride was detected at 2.0 ug/L in soil method blank VBLK061395L. The positive results for this compound in associated samples 027C000806 and 027C000512RE, which were less than 10X the blank amount, were flagged as undetected (U) with the laboratory results less than the CRQL being raised to the CRQL.

Methylene chloride was detected at 1.0 ug/L in water blank VBLK061495K. The positive result for this compound in associated sample 027H000545, which was less than 10X the blank amount, was flagged as non-detected with the laboratory results less than the CRQL being raised to the CRQL.

Trip Blank:

There were no trip blanks associated with this SDG. No action was necessary.

TIC's:

There were no TIC's reported in the method blanks for this SDG.

V.) Surrogate Recoveries:

The Percent Recoveries (%R's) of DCE exceeded the 70-121% QC limits in samples 027C000806 (122%) and 027C000806RE (123%). The positive result for methylene chloride in sample 027C000806RE was flagged as estimated (J). No further action was required.

VI.) Matrix Spike/Matrix Spike Duplicate (MS / MSD):

MS / MSD analysis was not performed in this fraction. No action was taken.

VII.) Field Duplicates:

There were no field duplicate samples for this fraction. No action was necessary.

VIII.) Internal Standards Performance:

The Percent Recoveries (%R's) of 1,4-difluorobenzene (41%) and chlorobenzene-d5 (40%) in sample 027C000512 were below the 50-200% QC limits. All positive and non-detect results for the associated compounds in this sample were flagged as estimated (J) and (UJ).

The Percent Recoveries (%R's) of bromochloromethane (48%), 1,4-difluorobenzene (37%) and chlorobenzene-d5 (35%) in sample 027C000512RE were below the 50-200% QC limits. All associated sample results for these compounds, which consisted entirely of non-detects, were flagged as estimated (UJ).

The Percent Recoveries (%R's) of bromochlorobenzene (40%), 1,4-difluorobenzene (30%) and chlorobenzene-d5 (27%) in sample 027C000806 were below the 50-200% QC limits. All associated

sample results for these compounds, which consisted entirely of non-detects, were flagged as estimated (UJ).

The Percent Recoveries (%R's) of bromochlorobenzene (42%), 1,4-difluorobenzene (36%) and chlorobenzene-d5 (32%) in sample 027C000806RE were below the 50-200% QC limits. The associated positive and non-detect sample results for these compounds were flagged as estimated (J) and (UJ).

IX.) TCL Compound Identification:

All TCL criteria were met, so no action was necessary.

X.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met. No action was required.

XI.) Tentatively Identified Compounds (TIC's):

All TIC criteria were met, so no action was taken.

XII.) System Performance:

All criteria were met, so no action was necessary.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualification. The original sample 027C000512, having fewer qualification flags than the reextraction, was considered by the validator to be of preferable data quality. The original sample 027C000806 was considered by the validator to be of preferable data quality as compared to the reextraction due to shorter holding times.

TOTAL METALS

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Calibration criteria were met. No action was required.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

<u>Blank</u>			<u>Action Level</u>
<u>Type/ID#</u>	<u>Analyte</u>	<u>Max. Conc.</u>	<u>mg/kg</u>
CCB2	arsenic	3.80 ug/L	3.80
CCB4	cobalt	3.20 ug/L	3.20
PBS	selenium	0.55 mg/kg	2.75
CCB1	tin	20.2 ug/L	20.2

CCB = Continuing Calibration Blank, PBS = Preparation Blank Soil

All results greater than the IDL but less than 5X the blank amount (Action Level mg/kg for soil samples) for which the contaminated blank was an associated calibration or laboratory preparation blank were flagged as undetected (U).

The following analytes had negative results with absolute values greater than the IDL's:

<u>Blank</u>			
<u>Type/ID#</u>	<u>Analyte</u>	<u>Neg. Conc.</u>	<u>5X Conc.</u>
PBS	silver	-1.16 mg/kg	5.80 mg/kg
CCB7	thallium	-3.20 ug/L	3.20 mg/kg
CCB3	zinc	-13.7 ug/L	13.7 mg/kg

CCB = Continuing Calibration Blank, PBS = Preparation Blank Soil

All associated positive sample results less than 5X the absolute value of the negative blank result were flagged as estimated (J) and all non-detects were flagged as estimated (UJ).

IV.) ICP Interference Check Sample Results:

All Interference Check Sample criteria were met. No action was required.

V.) ICP Serial Dilution Analysis:

All Serial Dilution criteria were met, so no action was necessary.

VI.) Laboratory Control Samples (LCS):

All Laboratory Control Sample criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

All Duplicate Sample criteria were met. No action was necessary.

VIII.) Matrix Spike Recoveries:

The Percent Recoveries (%R's) of the following analytes were below the 75-125% QC limits for sample 027S000512MS:

<u>Analyte</u>	<u>%R</u>
antimony	31.2%
selenium	22.9%
silver	16.9%
thallium	70.2%

All positive and non-detect results for antimony and thallium were flagged as estimated (J) and (UJ). Due to excessively low %R's (<30%) all positive detections of selenium and silver were flagged as estimated (J) and all non-detects were rejected (R).

IX.) Field Duplicates:

The Relative Percent Differences (RPD's) for the following analytes were calculated for field duplicate samples 027S000512 and 027C000512:

<u>Analyte</u>	<u>RPD</u>
arsenic	41%
barium	13%
beryllium	35%
chromium	14%
cobalt	34%
copper	12%
lead	42%
nickel	11%
selenium	43%
vanadium	36%
zinc	21%

All RPD's for these analytes were within the 60% QC limit for soil samples, so no action was taken.

The Relative Percent Differences (RPD's) for the following analytes were calculated for field duplicate samples 027S000806 and 027C000806:

<u>Analyte</u>	<u>RPD</u>
arsenic	57%
barium	20%
beryllium	15%
chromium	14%
cobalt	28%
copper	23%
lead	35%
nickel	17%
vanadium	0.6%
zinc	67%

The RPD for zinc exceeded the 60% QC limit for soil samples, so the results for zinc in these two samples were flagged as estimated (J). The RPD's for the other analytes were within the QC limits. No further action was required.

X.) Furnace Atomic Absorption QC:

Method of Standard Additions (MSA):

All MSA criteria were met. No action was required.

Post Digestion Spike Recoveries:

All Post Digestion Spike Recovery criteria were met. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met, so no action was taken.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All non-detect results for selenium and silver were rejected due to low (<30%) percent recoveries in the matrix spike sample. All remaining laboratory data were acceptable with qualification.

E/A&H VALIDATION SUMMARY REPORT

Site Name: NSA Memphis, Millington, Tennessee
CTO and Subtask No.: 0094-04730
Laboratory: NET, Bedford
Sample Delivery Group: 1717
Matrix: Soil

SDG 1717 Sample IDs and Analyses

Sample ID	Appendix IX Metals	SVOCs	Pest/PCBs
027S000101		X	X
027S000201		X	X
027S000501		X	X
027E030696*	X	X	X

Note: The "*" in the table above means the sample was a field or rinsate blank. Field and rinsate blanks were used to evaluate contamination in investigative samples. Therefore, results or qualifiers were not changed for these samples.

VALIDATION RESULTS

All samples were received by the laboratory intact and with the proper documentation on March 7, 1996, for metals, SVOCs, and pest/PCBs. The following sections summarize the data validation results.

Appendix IX Metals Fraction

1. Results in this SDG were for a rinsate blank only. Validation of the rinsate blank was not required. Any detections in the rinsate blank were assessed against associated samples in other SDGs.

SVOC Fraction

1. All holding times, GC/MS instrument performance checks, initial calibrations, continuing calibrations, surrogate recoveries, and internal standard performance were acceptable. No problems were encountered during review of sample result verification.
2. Di-n-butylphthalate was detected in one method blank and in rinsate blank 027E030696. The sample results were all less than the PQL; therefore, qualification of the data was not necessary.

Pesticide/PCB Fraction

1. All holding times, surrogate recoveries, blanks, and initial calibrations were

acceptable. No problems were encountered during review of sample result verification.

2. The following compounds exceeded the 25 % maximum control limits for the continuing calibration check:

Continuing Calibration Check Deficiencies

Compound	% Difference	Column	Associated Samples
4,4'-DDE	40.1	RXT15	027S000101 027S000201 027S000501
Aroclor-1260	27.3	RXT15	027S000101Dil 027S000201Dil
4,4'-DDE	46.2	RXT15	027S000101Dil 027S000201Dil
4,4'-DDE	34	RXT15	027S000501Dil

All results were less than the PQL and therefore were qualified as estimated (UJ).

3. Dieldrin in all three samples and alpha-Chlordane and gamma-Chlordane in sample 027S000201 exceed the calibration range. The values which exceeded the calibration range were substituted by diluted values.

DATALCP3
05/20/96

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SWMU 27

Page: 1
Time: 15:23

APX9-METAL		SAMPLE ID ----->	027-S-0001-01		027-S-0001-05		027-S-0001-14		027-S-0002-01		027-S-0002-06		027-S-0002-12	
		ORIGINAL ID ----->	027S000101		027S000105		027S000114		027S000201		027S000206		027S000212	
		LAB SAMPLE ID ----->	1-124683S		1-124684S		1-124685S		1-124686S		1-124687S		1-124688S	
		ID FROM REPORT ----->	027S000101		027S000105		027S000114		027S000201		027S000206		027S000212	
		SAMPLE DATE ----->	06/06/95		06/06/95		06/06/95		06/06/95		06/06/95		06/06/95	
		MATRIX ----->	Soil		Soil		Soil		Soil		Soil		Soil	
		UNITS ----->	MG/KG		MG/KG		MG/KG		MG/KG		MG/KG		MG/KG	
CAS #	Parameter	1441	VAL	1441	VAL	1441	VAL	1441	VAL	1441	VAL	1441	VAL	
SB	Antimony	19.1	J	20.4	J	12.8	UR	18.5	J	18.	J	12.8	UR	
AS	Arsenic	33.	J	11.9	J	6.4	J	15.9	J	13.2	J	5.3	J	
BA	Barium	153.	J	160.	J	72.9	J	109.	J	191.	J	73.8	J	
BE	Beryllium	1.2	J	0.42	J	0.34	J	0.97	J	0.54	J	0.33	J	
CD	Cadmium	1.3	J	2.6	J	2.2	J	0.7	UJ	2.4	J	1.3	J	
CR	Chromium	9.	J	9.4	J	6.4	J	5.5	J	10.3	J	7.4	J	
CO	Cobalt	3.8	UJ	8.1	J	7.4	J	4.5	UJ	11.9	J	8.	J	
CU	Copper	13.5	J	17.5	J	12.7	J	14.3	J	18.	J	16.1	J	
PB	Lead	40.4		12.6		8.5		22.9		14.5		10.7		
HG	Mercury	1.6		0.12	U	0.12	U	0.3		0.12	U	0.12	U	
NI	Nickel	5.5	UJ	20.8	J	15.1	J	5.9	UJ	26.3	J	16.5	J	
SE	Selenium	0.48	J	0.52	U	0.51	U	0.47	U	0.51	U	0.51	U	
AG	Silver	6.6	J	0.77	UJ	0.77	UJ	2.3	UJ	0.77	UJ	0.77	UJ	
TL	Thallium	0.43	UJ	0.52	UJ	0.51	UJ	0.47	UJ	0.51	UJ	0.51	UJ	
V	Vanadium	9.7	J	19.9	J	14.6	J	12.7	J	22.5	J	15.6	J	
ZN	Zinc	178.		54.2		39.9		69.7		60.8		51.1		
SN	Tin	12.1	J	3.9	UJ	5.5	J	5.5	J	4.4	J	3.8	UJ	

*** Validation Complete ***

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SWMU 27

APX9-METAL		SAMPLE ID ----->	027-S-0003-01	027-S-0003-06	027-S-0003-12	027-S-0004-01	027-S-0004-06	027-S-0004-12
		ORIGINAL ID ----->	027S000301	027S000306	027S000312	027S000401	027S000406	027S000412
		LAB SAMPLE ID ---->	8-124859S	8-124860S	8-124861S	8-124862S	8-124863S	8-124864S
		ID FROM REPORT -->	027S000301	027S000306	027S000312	027S000401	027S000406	027S000412
		SAMPLE DATE ----->	06/08/95	06/08/95	06/08/95	06/08/95	06/08/95	06/08/95
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil
		UNITS ----->	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG
CAS #	Parameter		1446 VAL	1446 VAL	1446 VAL	1446 VAL	1446 VAL	1446 VAL
SB	Antimony		11.8 UJ	12.3 UJ	12.9 UJ	13.9 UJ	12.3 UJ	12.9 UJ
AS	Arsenic		4.9	6.3	10.6	3.5 U	10.3	10.
BA	Barium		111.	197.	131.	225.	163.	100.
BE	Beryllium		0.83 J	0.61 J	0.46 J	0.68 J	0.46 J	0.41 J
CD	Cadmium		0.97 J	0.74 U	0.77 U	1.6	0.74 U	0.78 U
CR	Chromium		8.6	14.3	13.8	17.	11.6	10.8
CO	Cobalt		3.2 J	11.7 J	7.2 J	5.8 J	10. J	8.7 J
CU	Copper		17.6	10.	12.4	38.4	11.7	12.9
PB	Lead		40.9	7.7	11.9	60.5	11.6	11.7
HG	Mercury		1.2	0.12 U	0.12 U	1.7	0.12 U	0.12 U
NI	Nickel		9.1 J	22.7	24.	11. J	28.1	20.1
SE	Selenium		0.76 UR	0.7 UR	0.73 UR	0.71 UR	0.63 UR	0.75 UR
AG	Silver		1.2 UR	1.2 UR	1.3 UR	8.4 J	1.2 UR	1.3 UR
TL	Thallium		0.47 UJ	0.49 UJ	0.51 UJ	0.56 UJ	0.49 UJ	0.52 UJ
V	Vanadium		11.1	20.8	24.6	17.7	18.8	17.3
ZN	Zinc		155.	47.1	57.	239.	54.5	53.1
SN	Tin		16.6 U	4.2 U	7.1 U	22.1 J	3.7 U	6.8 U

*** Validation Complete ***

NSA MEMPHIS
NAS MEMPHIS, RFI, ASSEMBLY C
SWMU 27

APX9-METAL		SAMPLE ID ----->		027-S-0005-01		027-S-0005-06		027-S-0005-12		027-C-0005-12		027-S-0006-01		027-S-0006-06	
		ORIGINAL ID ----->		027S000501		027S000506		027S000512		027C000512		027S000601		027S000606	
		LAB SAMPLE ID ---->		8-124865S		8-124866S		8-124867S		8-124857S		8-124868S		8-124869S	
		ID FROM REPORT -->		027S000501		027S000506		027S000512		027C000512		027S000601		027S000606	
		SAMPLE DATE ----->		06/08/95		06/08/95		06/08/95		06/08/95		06/08/95		06/08/95	
		MATRIX ----->		Soil		Soil		Soil		Soil		Soil		Soil	
		UNITS ----->		MG/KG		MG/KG		MG/KG		MG/KG		MG/KG		MG/KG	
CAS #	Parameter	1446	VAL	1446	VAL	1446	VAL	1446	VAL	1446	VAL	1446	VAL	1446	VAL
SB	Antimony	12.1	UJ	12.3	UJ	12.5	UJ	12.4	UJ	12.8	UJ	12.1	UJ		
AS	Arsenic	9.4		5.6		5.1		7.7		7.7		8.9			
BA	Barium	202.		121.		115.		131.		120.		294.			
BE	Beryllium	0.45	J	0.34	J	0.4	J	0.57	J	0.65	J	0.59	J		
CD	Cadmium	0.82	J	0.74	U	0.75	U	0.75	U	0.77	U	0.72	U		
CR	Chromium	11.2		9.9		15.		17.3		16.4		16.7			
CO	Cobalt	8.	J	6.1	J	5.1	J	7.2	J	6.6	J	8.7	J		
CU	Copper	23.5		7.1		7.9		8.9		11.		13.1			
PB	Lead	43.7		7.		7.8		11.9		30.6		9.4			
HG	Mercury	0.75		0.12	U	0.12	U	0.12	U	0.25		0.11	U		
NI	Nickel	18.7		14.9		14.9		16.6		14.9		33.1			
SE	Selenium	0.58	UR	0.52	UR	1.1	UR	0.71	UR	0.86	UR	0.54	UR		
AG	Silver	2.3	J	1.2	UR	1.2	UR	1.2	UR	1.3	UR	1.2	UR		
TL	Thallium	0.48	UJ	0.49	UJ	0.5	UJ	0.87	UJ	0.51	UJ	0.48	UJ		
V	Vanadium	15.4		14.4		17.5		25.1		19.1		30.			
ZN	Zinc	138.		39.5		45.9		56.9		86.8		73.4			
SN	Tin	11.3	U	4.8	U	3.7	U	3.7	U	6.4	U	6.4	U		

*** Validation Complete ***

NSA MEMPHIS
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SWMU 27

APX9-METAL		SAMPLE ID ----->	027-S-0006-12	027-S-0007-01	027-S-0007-06	027-S-0007-12	027-S-0008-01	027-S-0008-06	
		ORIGINAL ID ----->	027S000612	027S000701	027S000706	027S000712	027S000801	027S000806	
		LAB SAMPLE ID ---->	8-124870S	8-124871S	8-124872S	8-124873S	8-124874S	8-124875S	
		ID FROM REPORT -->	027S000612	027S000701	027S000706	027S000712	027S000801	027S000806	
		SAMPLE DATE ----->	06/08/95	06/08/95	06/08/95	06/08/95	06/08/95	06/08/95	
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil	
		UNITS ----->	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	
CAS #	Parameter	1446	VAL	1446	VAL	1446	VAL	1446	VAL
SB	Antimony	12.6	UJ	10.7	UJ	12.	UJ	11.9	UJ
AS	Arsenic	5.1		4.		7.		10.6	
BA	Barium	110.		148.		167.		110.	
BE	Beryllium	0.39	J	0.21	U	0.46	J	0.41	J
CD	Cadmium	0.76	U	0.97	J	0.72	U	0.68	U
CR	Chromium	13.4		6.7		15.		12.8	
CO	Cobalt	4.2	J	1.3	U	7.	J	7.9	J
CU	Copper	8.6		38.3		7.7		8.8	
PB	Lead	6.1		277.		7.8		24.7	
HG	Mercury	0.12	U	3.1		0.11	U	0.13	
NI	Nickel	14.4		5.3	U	19.6		14.8	
SE	Selenium	0.71	UR	0.43	UR	0.48	UR	0.45	UR
AG	Silver	1.3	UR	15.8	J	1.2	UR	1.1	UR
TL	Thallium	0.5	UJ	0.43	UJ	0.48	UJ	0.45	UJ
V	Vanadium	12.9		2.8	J	23.5		18.3	
ZN	Zinc	55.5		163.		45.4		49.1	
SN	Tin	3.8	U	19.9	U	4.	U	4.1	U

*** Validation Complete ***

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SWMU 27

APX9-METAL		SAMPLE ID ----->	027-C-0008-06	027-S-0008-12	027-C-0008-12	027-S-0009-01	027-S-0009-06	027-S-0009-12
		ORIGINAL ID ----->	027C000806	027S000812	027C000812	027S000901	027S000906	027S000912
		LAB SAMPLE ID ---->	8-124858S	9-124878S	9-124877S	9-124879S	9-124880S	9-124881S
		ID FROM REPORT -->	027C000806	027S000812	027C000812	027S000901	027S000906	027S000912
		SAMPLE DATE ----->	06/08/95	06/08/95	06/08/95	06/08/95	06/08/95	06/08/95
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil
		UNITS ----->	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG
CAS #	Parameter		1446 VAL	1447 VAL	1447 VAL	1447 VAL	1447 VAL	1447 VAL
SB	Antimony		12.1 UJ	12.5 UJ	12.6 UJ	12.3 UJ	12.8 UJ	13. UJ
AS	Arsenic		7.9	9.2	7.8	11.2	13.7	7.9
BA	Barium		113.	77.8	68.6	52.7	134.	60.1
BE	Beryllium		0.38 J	0.3 J	0.3 J	0.33 J	0.47 J	0.28 J
CD	Cadmium		0.73 U	0.99 J	1.3 J	1.1 J	1.9 J	0.78 UJ
CR	Chromium		11.7	6.7 J	8.	9.7	10.	4.9 J
CO	Cobalt		7. J	6.5 J	6.4 J	5.4 J	7.1 J	5.7 J
CU	Copper		9.4	12.9	13.4	11.3	18.1	13.2
PB	Lead		9.6	9.4	6.8	10.2	13.	9.
HG	Mercury		0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
NI	Nickel		18.3	23.2	18.5	10.2	26.6	17.5
SE	Selenium		0.75 UR	0.53 J	0.51 UJ	0.5 J	0.51 UJ	0.53 J
AG	Silver		1.2 UR	0.77 U	0.83 J	0.74 U	0.76 U	0.97 J
TL	Thallium		0.48 UJ	0.5 UJ	0.51 UJ	0.49 UJ	0.51 UJ	0.5 UJ
V	Vanadium		17.1	12.5 J	13.2	26.1	18.9	13.1
ZN	Zinc		44.6 J	40.	42.8	31.6	59.	38.
SN	Tin		4.8 U	5.2 U	3.8 U	3.7 U	4.3 U	7.7 U

*** Validation Complete ***

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SWMU 27

SUB46-PEST		SAMPLE ID ----->	027-S-0001-01	027-S-0002-01	027-S-0005-01			
		ORIGINAL ID ----->	027SSB1001	027SSB1101	027SSB1201			
		LAB SAMPLE ID ---->	143759	143760	143761			
		ID FROM REPORT -->	027SSB1001	027SSB1101	027SSB1201			
		SAMPLE DATE ----->	03/06/96	03/06/96	03/06/96			
		DATE EXTRACTED -->	03/14/96	03/14/96	03/14/96			
		DATE ANALYZED ---->	03/16/96	03/16/96	03/18/96			
		MATRIX ----->	Soil	Soil	Soil			
		UNITS ----->	UG/KG	UG/KG	UG/KG			
CAS #	Parameter	1717	VAL	1717	VAL	1717	VAL	
309-00-2	Aldrin	2.1	U	9.7	J	2.	U	
58-89-9	gamma-BHC (Lindane)	2.1	U	2.	U	2.	U	
319-84-6	alpha-BHC	2.1	U	2.	U	2.	U	
319-85-7	beta-BHC	2.1	U	2.	U	2.	U	
319-86-8	delta-BHC	2.1	U	2.	U	2.	U	
72-54-8	4,4'-DDD	4.2	U	4.	U	2.6	J	
72-55-9	4,4'-DDE	4.2	UJ	4.	UJ	4.1	UJ	
50-29-3	4,4'-DDT	7.1	J	19.	J	14.	J	
60-57-1	Dieldrin	200.	D	1200.	D	710.	D	
959-98-8	Endosulfan I	2.1	U	2.	U	2.	U	
33213-65-9	Endosulfan II	4.2	U	4.	U	4.1	U	
1031-07-8	Endosulfan sulfate	4.2	U	4.	U	4.1	U	
72-20-8	Endrin	4.2	U	8.1	J	4.5		
7421-93-4	Endrin aldehyde	4.2	U	4.	U	4.1	U	
76-44-8	Heptachlor	2.1	U	2.	U	2.	U	
1024-57-3	Heptachlor epoxide	3.2	J	19.		6.	J	
72-43-5	Methoxychlor	21.	U	20.	U	20.	U	
8001-35-2	Toxaphene	42.	U	40.	U	41.	U	
12674-11-2	Aroclor-1016	42.	U	40.	U	41.	U	
11104-28-2	Aroclor-1221	42.	U	40.	U	41.	U	
11141-16-5	Aroclor-1232	42.	U	40.	U	41.	U	
53469-21-9	Aroclor-1242	42.	U	40.	U	41.	U	
12672-29-6	Aroclor-1248	42.	U	40.	U	41.	U	
11097-69-1	Aroclor-1254	42.	U	40.	U	41.	U	
11096-82-5	Aroclor-1260	42.	U	40.	U	41.	U	
53494-70-5	Endrin ketone	4.2	U	4.	U	4.1	U	
5103-71-9	alpha-Chlordane	19.		120.	D	2.	U	
5103-74-2	gamma-Chlordane	8.1		200.	UD	2.	U	
12789-03-6	Technical Chlordane	110.		670.		41.	U	

NSA MEMPHIS
NAS MEMPHIS, RFI, ASSEMBLY C
SWMU 27

SUB46-SYOA		SAMPLE ID ----->	027-S-0001-01	027-S-0002-01	027-S-0005-01			
		ORIGINAL ID ----->	027SSB1001	027SSB1101	027SSB1201			
		LAB SAMPLE ID ----->	143759	143760	143761			
		ID FROM REPORT ----->	027SSB1001	027SSB1101	027SSB1201			
		SAMPLE DATE ----->	03/06/96	03/06/96	03/06/96			
		DATE EXTRACTED ----->	03/11/96	03/11/96	03/11/96			
		DATE ANALYZED ----->	03/12/96	03/12/96	03/12/96			
		MATRIX ----->	Soil	Soil	Soil			
		UNITS ----->	ug/Kg	ug/Kg	ug/Kg			
CAS #	Parameter	1717	VAL	1717	VAL	1717	VAL	
108-95-2	Phenol	420.	U	400.	U	410.	U	
111-44-4	bis(2-Chloroethyl)ether	420.	U	400.	U	410.	U	
95-57-8	2-Chlorophenol	420.	U	400.	U	410.	U	
541-73-1	1,3-Dichlorobenzene	420.	U	400.	U	410.	U	
106-46-7	1,4-Dichlorobenzene	420.	U	400.	U	410.	U	
95-50-1	1,2-Dichlorobenzene	420.	U	400.	U	410.	U	
95-48-7	2-Methylphenol (o-Cresol)	420.	U	400.	U	410.	U	
108-60-1	2,2'-oxybis(1-Chloropropane)	420.	U	400.	U	410.	U	
106-44-5	4-Methylphenol (p-Cresol)	420.	U	400.	U	410.	U	
621-64-7	N-Nitroso-di-n-propylamine	420.	U	400.	U	410.	U	
67-72-1	Hexachloroethane	420.	U	400.	U	410.	U	
98-95-3	Nitrobenzene	420.	U	400.	U	410.	U	
78-59-1	Isophorone	420.	U	400.	U	410.	U	
88-75-5	2-Nitrophenol	420.	U	400.	U	410.	U	
105-67-9	2,4-Dimethylphenol	420.	U	400.	U	410.	U	
120-83-2	2,4-Dichlorophenol	420.	U	400.	U	410.	U	
120-82-1	1,2,4-Trichlorobenzene	420.	U	400.	U	410.	U	
91-20-3	Naphthalene	420.	U	250.	J	410.	U	
106-47-8	4-Chloroaniline	420.	U	400.	U	410.	U	
87-68-3	Hexachlorobutadiene	420.	U	400.	U	410.	U	
111-91-1	bis(2-Chloroethoxy)methane	420.	U	400.	U	410.	U	
59-50-7	4-Chloro-3-methylphenol	420.	U	400.	U	410.	U	
91-57-6	2-Methylnaphthalene	420.	U	63.	J	410.	U	
77-47-4	Hexachlorocyclopentadiene	420.	U	400.	U	410.	U	
88-06-2	2,4,6-Trichlorophenol	420.	U	400.	U	410.	U	
95-95-4	2,4,5-Trichlorophenol	1000.	U	1000.	U	1000.	U	
91-58-7	2-Chloronaphthalene	420.	U	400.	U	410.	U	
88-74-4	2-Nitroaniline	1000.	U	1000.	U	1000.	U	
131-11-3	Dimethyl phthalate	420.	U	400.	U	410.	U	
208-96-8	Acenaphthylene	420.	U	43.	J	45.	J	
606-20-2	2,6-Dinitrotoluene	420.	U	400.	U	410.	U	
99-09-2	3-Nitroaniline	1000.	U	1000.	U	1000.	U	
83-32-9	Acenaphthene	420.	U	300.	J	410.	U	
51-28-5	2,4-Dinitrophenol	1000.	U	1000.	U	1000.	U	
100-02-7	4-Nitrophenol	1000.	U	1000.	U	1000.	U	
132-64-9	Dibenzofuran	420.	U	240.	J	410.	U	

*** Validation Complete ***

DATALCP3
05/20/96

NSA MEMPHIS
NAS MEMPHIS, RFI, ASSEMBLY C
SWMU 27

Page: 8
Time: 15:23

SUB46-SVOA		SAMPLE ID ----->	027-S-0001-01	027-S-0002-01	027-S-0005-01			
		ORIGINAL ID ----->	027SSB1001	027SSB1101	027SSB1201			
		LAB SAMPLE ID --->	143759	143760	143761			
		ID FROM REPORT -->	027SSB1001	027SSB1101	027SSB1201			
		SAMPLE DATE ----->	03/06/96	03/06/96	03/06/96			
		DATE EXTRACTED -->	03/11/96	03/11/96	03/11/96			
		DATE ANALYZED --->	03/12/96	03/12/96	03/12/96			
		MATRIX ----->	Soil	Soil	Soil			
		UNITS ----->	ug/Kg	ug/Kg	ug/Kg			
CAS #	Parameter		1717 VAL	1717 VAL	1717 VAL			
121-14-2	2,4-Dinitrotoluene	420.	U	400.	U	410.	U	
84-66-2	Diethylphthalate	420.	U	400.	U	410.	U	
7005-72-3	4-Chlorophenylphenylether	420.	U	400.	U	410.	U	
86-73-7	Fluorene	420.	U	380.	J	410.	U	
100-01-6	4-Nitroaniline	1000.	U	1000.	U	1000.	U	
534-52-1	2-Methyl-4,6-Dinitrophenol	1000.	U	1000.	U	1000.	U	
86-30-6	N-Nitrosodiphenylamine	420.	U	400.	U	410.	U	
101-55-3	4-Bromophenyl-phenylether	420.	U	400.	U	410.	U	
118-74-1	Hexachlorobenzene	420.	U	400.	U	410.	U	
87-86-5	Pentachlorophenol	1000.	U	1000.	U	1000.	U	
85-01-8	Phenanthrene	420.	U	3000.		360.	J	
120-12-7	Anthracene	420.	U	640.		94.	J	
86-74-8	Carbazole	420.	U	600.		40.	J	
84-74-2	Di-n-butylphthalate	420.	U	400.	U	410.	U	
206-44-0	Fluoranthene	79.	J	2900.		630.		
129-00-0	Pyrene	79.	J	2400.		560.		
85-68-7	Butylbenzylphthalate	420.	U	400.	U	410.	U	
91-94-1	3,3'-Dichlorobenzidine	420.	U	400.	U	410.	U	
56-55-3	Benzo(a)anthracene	41.	J	1400.		320.	J	
218-01-9	Chrysene	50.	J	1300.		310.	J	
117-81-7	bis(2-Ethylhexyl)phthalate (BEHP)	420.	U	400.	U	410.	U	
117-84-0	Di-n-octyl phthalate	420.	U	400.	U	410.	U	
205-99-2	Benzo(b)fluoranthene	50.	J	1200.		330.	J	
207-08-9	Benzo(k)fluoranthene	50.	J	890.		280.	J	
50-32-8	Benzo(a)pyrene	51.	J	1100.		290.	J	
193-39-5	Indeno(1,2,3-cd)pyrene	420.	U	520.		140.	J	
53-70-3	Dibenz(a,h)anthracene	420.	U	230.	J	43.	J	
191-24-2	Benzo(g,h,i)perylene	41.	J	530.		160.	J	

*** Validation Complete ***

DATALCP3
05/20/96

NSA MEMPHIS
NAS MEMPHIS, RFI, ASSEMBLY C
SWMU 27

Page: 9
Time: 15:23

SMB46-VOA		SAMPLE ID ----->		027-C-0005-12	027-H-0005-45		027-C-0008-06		027-C-0008-12		027-H-0009-44		
		ORIGINAL ID ----->		027C000512	027H000545		027C000806		027C000812		027H000944		
		LAB SAMPLE ID ----->		124857	124876		124858		124877		124882		
		ID FROM REPORT ----->		027C000512	027H000545		027C000806		027C000812		027H000944		
		SAMPLE DATE ----->		06/08/95	06/08/95		06/08/95		06/08/95		06/08/95		
		DATE ANALYZED ----->		06/12/95	06/14/95		06/13/95		06/12/95		06/13/95		
		MATRIX ----->		Soil	Water		Soil		Soil		Water		
		UNITS ----->		UG/KG	UG/L		UG/KG		UG/KG		UG/L		
CAS #	Parameter	1446	VAL	1446	VAL	1446	VAL	1447	VAL	1447	VAL		
74-87-3	Chloromethane	12.	U	10.	U	12.	UJ	12.	U	10.	U		
74-83-9	Bromomethane	12.	U	10.	U	12.	UJ	12.	U	10.	U		
75-01-4	Vinyl chloride	12.	U	10.	U	12.	UJ	12.	U	10.	U		
75-00-3	Chloroethane	12.	U	10.	U	12.	UJ	12.	U	10.	U		
75-09-2	Methylene chloride	2.	J	10.	UJ	12.	UJ	12.	U	10.	UJ		
67-64-1	Acetone	12.	U	7.	J	12.	UJ	12.	U	18.			
75-15-0	Carbon disulfide	12.	U	10.	U	12.	UJ	12.	U	2.	J		
75-35-4	1,1-Dichloroethene	12.	U	10.	U	12.	UJ	12.	U	10.	U		
75-34-3	1,1-Dichloroethane	12.	U	10.	U	12.	UJ	12.	U	10.	U		
540-59-0	1,2-Dichloroethene (total)	12.	U	10.	U	12.	UJ	12.	UJ	10.	U		
67-66-3	Chloroform	12.	U	10.	U	12.	UJ	12.	U	10.	U		
107-06-2	1,2-Dichloroethane	12.	U	10.	U	12.	UJ	12.	U	10.	U		
78-93-3	2-Butanone (MEK)	12.	U	10.	U	12.	UJ	12.	U	10.	U		
71-55-6	1,1,1-Trichloroethane	12.	UJ	10.	U	12.	UJ	12.	U	10.	U		
56-23-5	Carbon tetrachloride	12.	UJ	10.	UJ	12.	UJ	12.	U	10.	U		
75-27-4	Bromodichloromethane	12.	UJ	10.	U	12.	UJ	12.	U	10.	U		
78-87-5	1,2-Dichloropropane	12.	UJ	10.	U	12.	UJ	12.	U	10.	U		
10061-01-5	cis-1,3-Dichloropropene	12.	UJ	10.	U	12.	UJ	12.	U	10.	U		
79-01-6	Trichloroethene	12.	UJ	10.	U	12.	UJ	12.	U	10.	U		
124-48-1	Dibromochloromethane	12.	UJ	10.	U	12.	UJ	12.	U	10.	U		
79-00-5	1,1,2-Trichloroethane	12.	UJ	10.	U	12.	UJ	12.	U	10.	U		
71-43-2	Benzene	12.	UJ	10.	U	12.	UJ	12.	U	10.	U		
10061-02-6	trans-1,3-Dichloropropene	12.	UJ	10.	U	12.	UJ	12.	U	10.	U		
75-25-2	Bromoform	12.	UJ	10.	U	12.	UJ	12.	U	10.	U		
108-10-1	4-Methyl-2-Pentanone (MIBK)	12.	UJ	10.	U	12.	UJ	12.	U	10.	U		
591-78-6	2-Hexanone	12.	UJ	10.	U	12.	UJ	12.	U	10.	U		
127-18-4	Tetrachloroethene	12.	UJ	10.	U	12.	UJ	12.	U	10.	U		
79-34-5	1,1,2,2-Tetrachloroethane	12.	UJ	10.	U	12.	UJ	12.	U	10.	U		
108-88-3	Toluene	12.	UJ	1.	J	12.	UJ	12.	U	10.	U		
108-90-7	Chlorobenzene	12.	UJ	10.	U	12.	UJ	12.	U	10.	U		
100-41-4	Ethylbenzene	12.	UJ	10.	U	12.	UJ	12.	U	10.	U		
100-42-5	Styrene	12.	UJ	10.	U	12.	UJ	12.	U	10.	U		
1330-20-7	Xylene (Total)	12.	UJ	10.	U	12.	UJ	12.	U	10.	U		

*** Validation Complete ***

SWMU 62

DATA QUALIFICATION SUMMARY

NET, Inc. - 1411 Organics

SAMPLES: 015C005007, 015C019017, 015C020007, 021C000201, 021C000201MS,
021C000201MSD, 021H000202, 021H001017, 021C003010, 021H003048, 062C002020,
062C005020, 062H005041, 062C006020

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met. No action was necessary.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met. No action was required.

Continuing Calibration:

The Percent Differences (%D's) of bromomethane (31.4%) and chloroethane (40.6%) exceeded the 25% QC limit for the continuing calibration run on 6/01/95 at 13:47 on instrument HP5970H. The non-detect results for these compounds in associated sample 021C003010 were flagged as estimated (UJ).

The Percent Differences (%D's) of the following compounds exceeded the 25% QC limit for the continuing calibration run on 6/01/95 at 11:36 on instrument HP5970K:

bromomethane	25.4%
2-butanone	27.6%
2-hexanone	26.4%

The results for these compounds in associated sample 021H003048, which consisted entirely of non-detects, were flagged as estimated (UJ).

The Percent Differences (%D's) of dibromochloromethane (26.1%) and 1,1,2-trichloroethane (26.0%) exceeded the 25% QC limit for the continuing calibration run on 5/26/95 at 10:03 on instrument HP5970L. The results for these compounds in associated samples 015C005007, 015C020007, 015C019017, 062C006020, 062C005020, 062C002020 and 021C000201, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

Acetone and 2-hexanone were detected at 7.0 ug/kg and 3.0 ug/kg, respectively, in soil method blank VBLK052695L. The positive results for acetone in associated samples 015C005007, 015C020007, 015C019017, 062C006020, 062C005020, 062C002020 and 021C000201 less than 10X the blank amount were flagged as undetected (U) with the detection limit being raised to the level of contamination in each sample. There were no positive detections for 2-hexanone in the associated samples. No further action was necessary.

Acetone and xylene were detected at 2.0 ug/L and 1.0 ug/L, respectively, in water blank VBLK060195H. The result for acetone in associated sample 021H003048 was greater than 10X the blank amount, so no action was necessary. The result for xylene in the associated sample was a non-detect, so no action was required.

TIC's:

There were no TIC's reported in the blanks for this SDG. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Matrix Spike/Matrix Spike Duplicate (MS/MSD):

All MS / MSD criteria were met. No action was required.

VII.) Field Duplicates:

The field duplicates for samples 015C005007, 015C019017, 015C020007, 021C000201, 021H000202, 021H001017, 021C003010, 021H003048, 062C002020, 062C005020, 062C006020 and 062H005041 were not analyzed in this SDG. No action was required.

VIII.) Internal Standards Performance:

All Internal Standards Performance criteria were met. No action was required.

IX.) TCL Compound Identification:

All TCL criteria were met, so no action was necessary.

X.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met. No action was required.

XI.) Tentatively Identified Compounds (TIC's):

All TIC criteria were met, so no action was taken.

XII.) System Performance:

All criteria were met, so no action was necessary.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualification.

DATA ASSESSMENT NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP OLM01.8 Method; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # 1695

A validation was performed on the Semivolatile Data from SDG 1695. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Continuing Calibrations

Qualifications were required because the continuing calibration %Ds were not all within the 25% difference criteria.

DATA ASSESSMENT NARRATIVE SEMIVOLATILE ANALYSIS

PAGE - 2

Continuing Calibrations, continued

Specific Findings

The continuing calibration standard, J487 contained compounds with %Ds greater than 50% but less than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

062S000701	4-chloroaniline (60.2%)
062S000801	N-nitrosodiphenylamine (67.2%)
062S000901	

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates that 5% of data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
062S000701	4-chloroaniline	+/-	J/UJ
062S000801	N-nitrosodiphenylamine		
062S000901			

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED PESTICIDES/PCBs

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # 1695

A validation was performed on the Pesticide/PCB Data from SDG 1591. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- Compound Identification/Quantitation

* - All criteria were met for this parameter.

Compound Quantitation

Some results were reported with P flags to indicate that column quantitation %Ds were greater than 25 %.

Specific Finding

All positive results reported with P flags are qualified as estiamted, J, due to column quantitation %Ds greater than 25 %.

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates that 5 % of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
All	All P flagged	+	J

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

METALS

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # 1695

A validation was performed on the Metals Data from SDG 1695. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- * ● Blanks
- * ● Interferences
- Matrix Spike Recovery
- * ● Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- * ● Serial Dilutions
- MSAs

* - All criteria were met for this parameter.

Matrix Spike Recovery

Specific Finding

The Matrix Spike recoveries for soils for Antimony (45%) and Silver (66%) were below the lower control limits (<75% but >30%). All positive and non-detect results are qualified as estimated, "J" or "UJ".

Laboratory Duplicate Analysis

Specific Finding

The duplicate analysis for Silver was less than 2 times the CRDL. No qualification is necessary.

MSAs

Specific Finding

The post digestion spike recovery for GFAA was above the upper control limits (>115%). All positive results for the listed samples below are qualified as estimated, "J".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>	<u>Action</u>
Thallium	062S701	116	no impact
Thallium	062S901	116	no impact

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafe's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
all soil samples	Sb and Ag.	+/-U	J/UJ
All "B" results	all analytes	B	J

DATALCP3
05/20/96

NSA MEMPHIS
NAS MEMPHIS, RFI, ASSEMBLY C
SWMU 62

Page: 1
Time: 15:25

APX9-METAL		SAMPLE ID -----> 062-S-0007-01		062-S-0008-01		062-S-0009-01				
		ORIGINAL ID -----> 062S000701		062S000801		062S000901				
		LAB SAMPLE ID ----> 142608S		142609S		142610S				
		ID FROM REPORT --> 062S000701		062S000801		062S000901				
		SAMPLE DATE ----->								
		MATRIX -----> Soil		Soil		Soil				
		UNITS -----> MG/KG		MG/KG		MG/KG				
CAS #	Parameter	1695	VAL	1695	VAL	1695	VAL			
SB	Antimony	7.3	UJ	7.2	UJ	7.3	UJ			
AS	Arsenic	10.5		10.4		9.7				
BA	Barium	150.		113.		113.				
BE	Beryllium	0.98	U	0.96	U	0.97	U			
CD	Cadmium	4.		3.9		2.9				
CR	Chromium	8.3		12.		8.9				
CO	Cobalt	10.5	J	9.7	J	8.6	J			
CU	Copper	18.9		18.9		18.				
PB	Lead	11.7		14.1		11.1				
HG	Mercury	0.12	U	0.12	U	0.12	U			
NI	Nickel	19.4		16.4		16.3				
SE	Selenium	0.49	U	0.48	U	0.49	U			
AG	Silver	3.	J	0.72	UJ	0.73	UJ			
TL	Thallium	0.73	U	0.72	U	0.73	U			
V	Vanadium	24.1		25.4		20.				
ZN	Zinc	59.		54.		49.7				
SN	Tin	20.3	J	22.5	J	12.	J			

*** Validation Complete ***

DATALCP3
05/20/96

NSA MEMPHIS
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SWMU 62

Page: 2
Time: 15:25

SUB46-PEST		SAMPLE ID ----->	062-S-0007-01	062-S-0008-01	062-S-0009-01			
		ORIGINAL ID ----->	062S000701	062S000801	062S000901			
		LAB SAMPLE ID ---->	142608	142609	142610			
		ID FROM REPORT -->	062S000701	062S000801	062S000901			
		SAMPLE DATE ----->	02/13/96	02/13/96	02/13/96			
		DATE EXTRACTED -->	02/15/96	02/15/96	02/15/96			
		DATE ANALYZED ---->	02/20/96	02/20/96	02/20/96			
		MATRIX ----->	Soil	Soil	Soil			
		UNITS ----->	UG/KG	UG/KG	UG/KG			
CAS #	Parameter		1695 VAL	1695 VAL	1695 VAL			
309-00-2	Aldrin		2. U	2. U	2. U			
58-89-9	gamma-BHC (Lindane)		2. U	2. U	2. U			
319-84-6	alpha-BHC		2. U	2. U	2. U			
319-85-7	beta-BHC		2. U	2. U	2. U			
319-86-8	delta-BHC		2. U	2. U	2. U			
72-54-8	4,4'-DDD		4.1 U	4. U	4.1 U			
72-55-9	4,4'-DDE		4.1 U	4. U	4.1 U			
50-29-3	4,4'-DDT		4.1 U	3. J	4.1 U			
60-57-1	Dieldrin		4.1 U	11.	4.1 U			
959-98-8	Endosulfan I		2. U	2. U	2. U			
33213-65-9	Endosulfan II		4.1 U	4. U	4.1 U			
1031-07-8	Endosulfan sulfate		4.1 U	4. U	4.1 U			
72-20-8	Endrin		4.1 U	4. U	4.1 U			
7421-93-4	Endrin aldehyde		4.1 U	4. U	4.1 U			
76-44-8	Heptachlor		2. U	2. U	2. U			
1024-57-3	Heptachlor epoxide		2. U	2. U	2. U			
72-43-5	Methoxychlor		20. U	20. U	20. U			
8001-35-2	Toxaphene		41. U	40. U	41. U			
12674-11-2	Aroclor-1016		41. U	40. U	41. U			
11104-28-2	Aroclor-1221		41. U	40. U	41. U			
11141-16-5	Aroclor-1232		41. U	40. U	41. U			
53469-21-9	Aroclor-1242		41. U	40. U	41. U			
12672-29-6	Aroclor-1248		41. U	40. U	41. U			
11097-69-1	Aroclor-1254		41. U	40. U	41. U			
11096-82-5	Aroclor-1260		41. U	40. U	41. U			
53494-70-5	Endrin ketone		4.1 U	4. U	4.1 U			
5103-71-9	alpha-Chlordane		2. U	2. U	2. U			
5103-74-2	gamma-Chlordane		2. U	2. U	2. U			
12789-03-6	Technical Chlordane		41. U	40. U	41. U			
57-74-9	Chlordane		41. U	40. U	41. U			

*** Validation Complete ***

DATALCP3
05/20/96

NSA MEMPHIS
NAS MEMPHIS, RFI, ASSEMBLY C
SWMU 62

Page: 3
Time: 15:25

SUB46-SYOA		SAMPLE ID ----->	062-S-0007-01	062-S-0008-01	062-S-0009-01			
		ORIGINAL ID ----->	062S000701	062S000801	062S000901			
		LAB SAMPLE ID ----->	142608	142609	142610			
		ID FROM REPORT ----->	062S000701	062S000801	062S000901			
		SAMPLE DATE ----->						
		DATE EXTRACTED ----->	02/16/96	02/16/96	02/16/96			
		DATE ANALYZED ----->	02/20/96	02/20/96	02/20/96			
		MATRIX ----->	Soil	Soil	Soil			
		UNITS ----->	ug/Kg	ug/Kg	ug/Kg			
CAS #	Parameter	1695	VAL	1695	VAL	1695	VAL	
108-95-2	Phenol	410.	U	400.	U	410.	U	
111-44-4	bis(2-Chloroethyl)ether	410.	U	400.	U	410.	U	
95-57-8	2-Chlorophenol	410.	U	400.	U	410.	U	
541-73-1	1,3-Dichlorobenzene	410.	U	400.	U	410.	U	
106-46-7	1,4-Dichlorobenzene	410.	U	400.	U	410.	U	
95-50-1	1,2-Dichlorobenzene	410.	U	400.	U	410.	U	
95-48-7	2-Methylphenol (o-Cresol)	410.	U	400.	U	410.	U	
108-60-1	2,2'-oxybis(1-Chloropropane)	410.	U	400.	U	410.	U	
106-44-5	4-Methylphenol (p-Cresol)	410.	U	400.	U	410.	U	
621-64-7	N-Nitroso-di-n-propylamine	410.	U	400.	U	410.	U	
67-72-1	Hexachloroethane	410.	U	400.	U	410.	U	
98-95-3	Nitrobenzene	410.	U	400.	U	410.	U	
78-59-1	Isophorone	410.	U	400.	U	410.	U	
88-75-5	2-Nitrophenol	410.	U	400.	U	410.	U	
105-67-9	2,4-Dimethylphenol	410.	U	400.	U	410.	U	
120-83-2	2,4-Dichlorophenol	410.	U	400.	U	410.	U	
120-82-1	1,2,4-Trichlorobenzene	410.	U	400.	U	410.	U	
91-20-3	Naphthalene	410.	U	400.	U	410.	U	
106-47-8	4-Chloroaniline	410.	UJ	400.	UJ	410.	UJ	
87-68-3	Hexachlorobutadiene	410.	U	400.	U	410.	U	
111-91-1	bis(2-Chloroethoxy)methane	410.	U	400.	U	410.	U	
59-50-7	4-Chloro-3-methylphenol	410.	U	400.	U	410.	U	
91-57-6	2-Methylnaphthalene	410.	U	400.	U	410.	U	
77-47-4	Hexachlorocyclopentadiene	410.	U	400.	U	410.	U	
88-06-2	2,4,6-Trichlorophenol	410.	U	400.	U	410.	U	
95-95-4	2,4,5-Trichlorophenol	1000.	U	1000.	U	1000.	U	
91-58-7	2-Chloronaphthalene	410.	U	400.	U	410.	U	
88-74-4	2-Nitroaniline	1000.	U	1000.	U	1000.	U	
131-11-3	Dimethyl phthalate	410.	U	400.	U	410.	U	
208-96-8	Acenaphthylene	410.	U	400.	U	410.	U	
606-20-2	2,6-Dinitrotoluene	410.	U	400.	U	410.	U	
99-09-2	3-Nitroaniline	1000.	U	1000.	U	1000.	U	
83-32-9	Acenaphthene	410.	U	400.	U	410.	U	
51-28-5	2,4-Dinitrophenol	1000.	U	1000.	U	1000.	U	
100-02-7	4-Nitrophenol	1000.	U	1000.	U	1000.	U	
132-64-9	Dibenzofuran	410.	U	400.	U	410.	U	

*** Validation Complete ***

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SWMU 62

SUB46-SVOA		SAMPLE ID ----->	062-S-0007-01	062-S-0008-01	062-S-0009-01			
		ORIGINAL ID ----->	062S000701	062S000801	062S000901			
		LAB SAMPLE ID ----->	142608	142609	142610			
		ID FROM REPORT ----->	062S000701	062S000801	062S000901			
		SAMPLE DATE ----->						
		DATE EXTRACTED ----->	02/16/96	02/16/96	02/16/96			
		DATE ANALYZED ----->	02/20/96	02/20/96	02/20/96			
		MATRIX ----->	Soil	Soil	Soil			
		UNITS ----->	ug/Kg	ug/Kg	ug/Kg			
CAS #	Parameter	1695	VAL	1695	VAL	1695	VAL	
121-14-2	2,4-Dinitrotoluene	410.	U	400.	U	410.	U	
84-66-2	Diethylphthalate	410.	U	400.	U	410.	U	
7005-72-3	4-Chlorophenylphenylether	410.	U	400.	U	410.	U	
86-73-7	Fluorene	410.	U	400.	U	410.	U	
100-01-6	4-Nitroaniline	1000.	U	1000.	U	1000.	U	
534-52-1	2-Methyl-4,6-Dinitrophenol	1000.	U	1000.	U	1000.	U	
86-30-6	N-Nitrosodiphenylamine	410.	UJ	400.	UJ	410.	UJ	
101-55-3	4-Bromophenyl-phenylether	410.	U	400.	U	410.	U	
118-74-1	Hexachlorobenzene	410.	U	400.	U	410.	U	
87-86-5	Pentachlorophenol	1000.	U	1000.	U	1000.	U	
85-01-8	Phenanthrene	410.	U	400.	U	410.	U	
120-12-7	Anthracene	410.	U	400.	U	410.	U	
86-74-8	Carbazole	410.	U	400.	U	410.	U	
84-74-2	Di-n-butylphthalate	410.	U	400.	U	410.	U	
206-44-0	Fluoranthene	410.	U	400.	U	410.	U	
129-00-0	Pyrene	410.	U	400.	U	410.	U	
85-68-7	Butylbenzylphthalate	410.	U	400.	U	410.	U	
91-94-1	3,3'-Dichlorobenzidine	410.	U	400.	U	410.	U	
56-55-3	Benzo(a)anthracene	410.	U	400.	U	410.	U	
218-01-9	Chrysene	410.	U	400.	U	410.	U	
117-81-7	bis(2-Ethylhexyl)phthalate (BEHP)	410.	U	400.	U	410.	U	
117-84-0	Di-n-octyl phthalate	410.	U	400.	U	410.	U	
205-99-2	Benzo(b)fluoranthene	410.	U	400.	U	410.	U	
207-08-9	Benzo(k)fluoranthene	410.	U	400.	U	410.	U	
50-32-8	Benzo(a)pyrene	410.	U	400.	U	410.	U	
193-39-5	Indeno(1,2,3-cd)pyrene	410.	U	400.	U	410.	U	
53-70-3	Dibenz(a,h)anthracene	410.	U	400.	U	410.	U	
191-24-2	Benzo(g,h,i)perylene	410.	U	400.	U	410.	U	

*** Validation Complete ***

DATACP3
05/20/96

NSA MEMPHIS
NAS MEMPHIS, RFI, ASSEMBLY C
SWMU 62

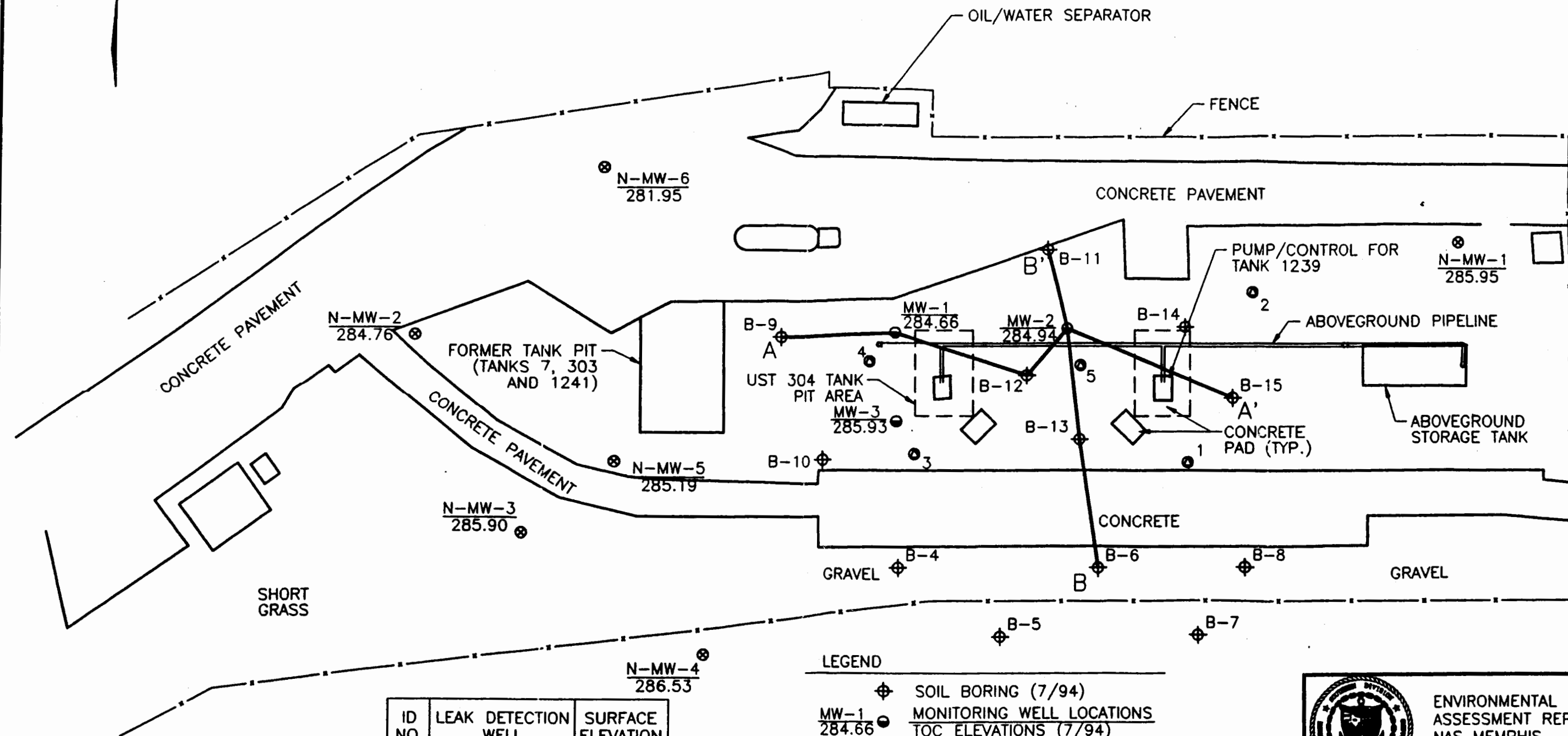
Page: 5
Time: 15:25

SMB46-VOA		SAMPLE ID ----->	062-C-0020-20	062-C-0050-20	062-H-0050-41	062-C-0060-20		
		ORIGINAL ID ----->	062C002020	062C005020	062H005041	062C006020		
		LAB SAMPLE ID ---->	123957	123956	123959	123955		
		ID FROM REPORT -->	062C002020	062C005020	062H005041	062C006020		
		SAMPLE DATE ----->	05/23/95	05/23/95	05/23/95	05/23/95		
		DATE ANALYZED ---->	05/26/95	05/26/95	05/27/95	05/26/95		
		MATRIX ----->	Soil	Soil	Water	Soil		
		UNITS ----->	UG/KG	UG/KG	UG/L	UG/KG		
CAS #	Parameter		1411 VAL	1411 VAL	1411 VAL	1411 VAL		
74-87-3	Chloromethane		13. U	13. U	10. U	12. U		
74-83-9	Bromomethane		13. U	13. U	10. U	12. U		
75-01-4	Vinyl chloride		13. U	13. U	10. U	12. U		
75-00-3	Chloroethane		13. U	13. U	10. U	12. U		
75-09-2	Methylene chloride		13. U	2. J	1. J	1. J		
67-64-1	Acetone		13. U	16. U	9. J	12. U		
75-15-0	Carbon disulfide		13. U	13. U	10. U	12. U		
75-35-4	1,1-Dichloroethene		13. U	13. U	10. U	12. U		
75-34-3	1,1-Dichloroethane		13. U	13. U	10. U	12. U		
540-59-0	1,2-Dichloroethene (total)		13. U	13. U	10. U	12. U		
67-66-3	Chloroform		13. U	13. U	10. U	12. U		
107-06-2	1,2-Dichloroethane		13. U	13. U	10. U	12. U		
78-93-3	2-Butanone (MEK)		13. U	13. U	10. U	12. U		
71-55-6	1,1,1-Trichloroethane		13. U	13. U	10. U	12. U		
56-23-5	Carbon tetrachloride		13. U	13. U	10. U	12. U		
75-27-4	Bromodichloromethane		13. U	13. U	10. U	12. U		
78-87-5	1,2-Dichloropropane		13. U	13. U	10. U	12. U		
10061-01-5	cis-1,3-Dichloropropene		13. U	13. U	10. U	12. U		
79-01-6	Trichloroethene		13. U	13. U	10. U	12. U		
124-48-1	Dibromochloromethane		13. UJ	13. UJ	10. U	12. UJ		
79-00-5	1,1,2-Trichloroethane		13. UJ	13. UJ	10. U	12. UJ		
71-43-2	Benzene		13. U	13. U	10. U	12. U		
10061-02-6	trans-1,3-Dichloropropene		13. U	13. U	10. U	12. U		
75-25-2	Bromoform		13. U	13. U	10. U	12. U		
108-10-1	4-Methyl-2-Pentanone (MIBK)		13. U	13. U	10. U	12. U		
591-78-6	2-Hexanone		13. U	13. U	10. U	12. U		
127-18-4	Tetrachloroethene		13. U	13. U	10. U	12. U		
79-34-5	1,1,2,2-Tetrachloroethane		13. U	13. U	10. U	12. U		
108-88-3	Toluene		13. U	13. U	1. J	12. U		
108-90-7	Chlorobenzene		13. U	13. U	10. U	12. U		
100-41-4	Ethylbenzene		13. U	13. U	10. U	12. U		
100-42-5	Styrene		13. U	13. U	10. U	12. U		
1330-20-7	Xylene (Total)		13. U	13. U	10. U	12. U		

*** Validation Complete ***

Attachment 2

Miscellaneous Soil Boring and Monitoring Well Logs



ID NO.	LEAK DETECTION WELL	SURFACE ELEVATION
1	MEM-T304-1	284.34'
2	MEM-T304-2	283.83'
3	MEM-T1239-1	284.08'
4	MEM-T1239-2	283.28'
5	MEM-1239-3	283.64'

LEGEND

- ⊕ SOIL BORING (7/94)
- MW-1 284.66 MONITORING WELL LOCATIONS TOC ELEVATIONS (7/94)
- ⊗ N-MW-4 286.53 EXISTING MONITORING WELLS TOP OF CASING ELEVATION
- EXISTING LEAK DETECTION MONITORING WELLS

NOTE: WELLS INSTALLED (7/94) ARE IDENTIFIED AS MEM-80-MW-1 THROUGH MW-3




ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
MILLINGTON, TN

FIGURE 3
SOIL BORING AND
MONITORING WELL LOCATION MAP
USTs 304 AND 1239 CTO-0080

DATE: 8/19/94 DWG NAME: CTO80_02

DEPTH (FEET)	SAMPLE TYPE	SAMPLE DEPTH	BLOWS/5 FT	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE - Cross					
0		0			0.0-3.0' CLAYEY SILT, TAN TO TAN AND LIGHT BROWN, FIRM TO STIFF.
3		400			3.0-8.0' CLAYEY SILT, GREYISH BROWN, MOIST, FIRM (WITH STRONG HYDROCARBON ODOR).
8		297			8.0-13.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
13		126			13.0-14.0' CLAYEY SILT, GREYISH BROWN, SOFT.
14					14.0-14.5' CLAYEY SILT, BROWN, STIFF.
14.8		328			14.5-15.4' CLAYEY SILT, GRAYISH BROWN, SOFT.
					15.4-16.4' SILTY CLAY, DARK BROWN, FIRM.
18		35			18.0-20.5' CLAYEY SILT TO SILTY CLAY, BROWN, MOIST, FIRM.
20.5		13			20.5-23.0' SILTY CLAY, TAN MOTTLED YELLOW TAN, FIRM TO STIFF.
DISCONTINUED BORING AT 23.0 FEET.					



ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO-0080

SOIL BORING B/MW-1
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/11/1994 PROJ. #: CTO00

DATE: 8/4/1994

DWG NAME: CTOSBB-

DEPTH (FEET)
SAMPLE TYPE
SAMPLE DEPTH
BLOWS/5 FT
ORGANIC MATTER (ppm)

DESCRIPTION OF SUBSURFACE MATERIALS

SURFACE - Grass

0	4	0.0-1.0' CLAYEY SILT, TAN WITH CONCRETE FRAGMENTS (FILL). 1.0-3.4' CLAYEY SILT, TAN MOTTLED GREY AND BLACK, STIFF.
3.4	421	3.4-5.8' CLAYEY SILT, GRAYISH BROWN, MOIST, FIRM (WITH HYDROCARBON ODOR).
5.8	102	5.8-8.0' SILTY CLAY, GRAYISH BROWN, MOIST, SOFT (WITH SLIGHT HYDROCARBON ODOR).
8	275	8.0-10.5' CLAYEY SILT, GREYISH BROWN, MOIST, SOFT.
10.5	92	10.5-15.2' SILTY CLAY, GREYISH BROWN TO TAN MOTTLED GREY, MOIST, SOFT.
13	27	
15.5	120	15.2-16.0' SILTY CLAY, GREYISH BROWN, VERY MOIST, SOFT.
		16.0-18.0' SILTY CLAY, DARK BROWN, MOIST, FIRM.
18	234	18.0-20.5' SILTY CLAY, DARK BROWN, MOIST, FIRM (WITH STRONG HYDROCARBON ODOR).
20.5	136	20.5-23.0' SILTY CLAY, BROWN, MOIST, FIRM (WITH HYDROCARBON ODOR).

DISCONTINUED BORING AT 23.0 FEET.

25

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ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO-0080

SOIL BORING B/MW-2

UST's 304 & 1239
MILLINGTON, TN

DATE INSTALLED: 7/11/1994 PROJ. #: CTO00

DATE: 8/4/1994

DWG NAME: CTOSBB-

DEPTH (FEET)
 SAMPLE TYPE
 SAMPLE DEPTH
 BLOWS/5 FT
 ORGANIC VAPOR (ppm)

DESCRIPTION OF SUBSURFACE MATERIALS

SURFACE - Gross

0	30	0.0-3.0' CLAYEY SILT, TAN GRADING TO TAN MOTTLED GREY, SLIGHTLY MOIST, STIFF.
3	56	3.0-8.0' CLAYEY SILT, GREYISH BROWN, WITH BLACK STAINING, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
8	48	8.0-13.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
13	81	13.0-18.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
18	86	18.0-20.5' SILTY CLAY, DARK BROWN, MOIST, FIRM TO STIFF (WITH HYDROCARBON ODOR).
20.5	112	20.5-23.0' SILTY CLAY, BROWN GRADING TO TAN, MOIST, FIRM TO STIFF (WITH SLIGHT HYDROCARBON ODOR).

DISCONTINUED BORING AT 23.0 FEET.



ENVIRONMENTAL
 ASSESSMENT REPORT
 NAS MEMPHIS
 CTO-0080

SOIL BORING B/MW-3

UST's 304 & 1239

MILLINGTON, TN

DATE INSTALLED: 7/12/1994 PROJ. #: CTO00

DATE: 8/4/1994

DWG NAME: CTOSBB-

DEPTH (FEET)
 SAMPLE TYPE
 SAMPLE DEPTH
 BLOWS / 5 FT
 ORGANIC VAPOR (ppm)

DESCRIPTION OF SUBSURFACE MATERIALS

SURFACE - Grass

5	4	4.0-6.0' CLAYEY SILT, GREYISH BROWN, MOIST, VERY FIRM TO STIFF (WITH HYDROCARBON ODOR).
10	9	9.0-11.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, FIRM TO SOFT (WITH HYDROCARBON ODOR).

DISCONTINUED BORING AT 11.0 FEET.

15
20
25
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ENVIRONMENTAL
 ASSESSMENT REPORT
 NAS MEMPHIS
 CTO-0080

SOIL BORING B-3A

UST's 304 & 1239
 MILLINGTON, TN

DATE INSTALLED: 7/12/1994 PROJ. #: CT0001

DATE: 8/4/1994

DWG NAME: CTOSB-3

DEPTH (FEET)
 SAMPLE TYPE
 SAMPLE DEPTH
 BLOWS/5 FT
 ORGANIC VAPOR (ppm)

DESCRIPTION OF SUBSURFACE MATERIALS

SURFACE - GROSS

0	9	0.0-1.5' CRUSHED LIMESTONE (FILL)
		1.5-3.0' CLAYEY SILT, GREYISH BROWN, SLIGHTLY MOIST, STIFF.
3	2	3.0-6.0' CLAYEY SILT, GREYISH BROWN, SLIGHTLY MOIST, FIRM (WITH HYDROCARBON ODOR).
5.5	9	6.0-7.0' CLAYEY SILT, BROWN MOTTLED BEIGE, MOIST, STIFF.
8	238	7.0-8.0' CLAYEY SILT, GREYISH BROWN MOTTLED GREY, MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR).
10.5	21	8.0-13.0' CLAYEY SILT, BROWNISH GREY MOTTLED GREY, VERY MOIST, FIRM (WITH HYDROCARBON ODOR).
13	11	13.0-18.0' CLAYEY SILT, BROWNISH GREY MOTTLED GREY, VERY MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR).
15.5	4.8	

DISCONTINUED BORING AT 18.0 FEET.



ENVIRONMENTAL
 ASSESSMENT REPORT
 NAS MEMPHIS
 CTO-0080

SOIL BORING B-4
 UST's 304 & 1239
 MILLINGTON, TN

DATE INSTALLED: 7/12/1994 PROJ. #: CT0008

DATE: 8/4/1994

DWG NAME: CTOSBB-4

DEPTH (FEET)
 SAMPLE TYPE
 SAMPLE DEPTH
 BLOWS/5 FT
 ORGANIC CARBON (ppm)

DESCRIPTION OF SUBSURFACE MATERIALS

SURFACE - Grass

0	15	0.0-2.0' CLAYEY SILT, TAN MOTTLED BROWN, SLIGHTLY MOIST, STIFF (FILL?)
3	15	2.0-3.0' SILT, SLIGHTLY CLAYEY, DARK BROWN, FIRM.
5	4	3.0-5.0' CLAYEY SILT, DARK BROWN, MOIST, FIRM
8	1	5.0-8.0' CLAYEY SILT, TAN MOTTLED GREY AND DARK BROWN, SLIGHTLY MOIST, STIFF (IN SITU SOIL).
13	4	8.0-13.0' CLAYEY SILT, TAN MOTTLED GREY AND DARK BROWN, MOIST, STIFF.
15.5	214	13.0-15.5' CLAYEY SILT, TAN MOTTLED GREY GRADING TO BROWN MOTTLED GREY, VERY MOIST, FIRM.
18	229	15.5-18.0' SAME AS ABOVE (WITH SLIGHT HYDROCARBON ODOR).
20.5	0	18.0- 20.5' SAME AS ABOVE (WITH SLIGHT HYDROCARBON ODOR).
23	10	20.5-23.0' CLAYEY SILT TO SILTY CLAY, DARK GREYISH BROWN GRADING TO DARK REDDISH BROWN, MOIST, STIFF.
		23.0-28.0' SILTY CLAY GRADING TO CLAYEY SILT, DARK BROWN GRADING TO BROWN MOTTLED TAN, MOIST TO VERY MOIST, STIFF TO FIRM.
DISCONTINUED BORING AT 28.0 FEET.		



ENVIRONMENTAL
 ASSESSMENT REPORT
 NAS MEMPHIS
 CTO-0080

SOIL BORING B-5
 UST's 304 & 1239
 MILLINGTON, TN

DATE INSTALLED: 7/13/1994 PROJ. #: CTOO

DATE: 8/4/1994

DWG NAME: CTOSBB

DEPTH (FEET)
 SAMPLE TYPE
 SAMPLE DEPTH
 BLOWS/5 FT
 ORGANIC VAPOR (ppm)

DESCRIPTION OF SUBSURFACE MATERIALS

SURFACE - Crushed Limestone

0	15	0.0-2.5' CLAYEY SILT, BROWN, STIFF
		2.5-3.0' CLAYEY SILT, DARK GREY, MOIST, SOFT.
3	4	3.0-6.0' CLAYEY SILT, GREYISH BROWN, MOIST, SOFT.
5.5	27	6.0-8.0' CLAYEY SILT, MOTTLED BROWN, TAN, AND GREY, MOIST, STIFF.
8	324	8.0-13.0' CLAYEY SILT, BROWN MOTTLED GREY AT TOP 1' GRADING TO GREYISH BROWN MOTTLED GREY, MOIST, SOFT (WITH HYDROCARBON ODOR).
10.5	303	
13	288	13.0-18.0' CLAYEY SILT, GREYISH BROWN MOTTLED GREY WITH SOME BLACK STAINING?, WET, SOFT (WITH SLIGHT HYDROCARBON ODOR).
15.5	304	

DISCONTINUED BORING AT 18.0 FEET.

20
25
30



ENVIRONMENTAL
 ASSESSMENT REPORT
 NAS MEMPHIS
 CTO-0080

SOIL BORING B-6

UST's 304 & 1239
 MILLINGTON, TN

DATE INSTALLED: 7/12/1994 PROJ. #: CTO00

DATE: 8/4/1994

DWG NAME: CTO588

DEPTH (FEET)
 SAMPLE DEPTH
 BLOWS/5 FT
 ORGANIC VAPOR (ppm)

DESCRIPTION OF SUBSURFACE MATERIALS

SURFACE - Grass

0	41	0.0-4.0' CLAYEY SILT, TAN TO BROWN. DRY TO SLIGHTLY MOIST, STIFF.
4	49	4.0-8.0' CLAYEY SILT, BROWN, VERY MOIST, FIRM.
8	14	8.0-8.5' CLAYEY SILT, TAN TO BROWN. SLIGHTLY MOIST, FIRM, FRIABLE.
10.5	86	8.5-13.0' CLAYEY SILT, GREYISH BROWN. MOTTLED GREY AND TAN, MOIST, FIRM (WITH HYDROCARBON ODOR).
13	94	13.0-18.0' SAME AS ABOVE (WITH HYDROCARBON ODOR).
15.5	81	
18	7	18.0-20.5' CLAYEY SILT, GREYISH BROWN. MOTTLED TAN, MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR).
20.5	7	20.5-22.0' CLAYEY SILT, GREY, VERY MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR).
		22.0-23.0' SILTY CLAY, DARK BROWN, MOIST, STIFF (OIL SHEEN ON SAMPLER).
23	0	23.0-28.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, FIRM (WITH TRACE OF STAINING).
25.5	1	
DISCONTINUED BORING AT 28.0 FEET.		




ENVIRONMENTAL
 ASSESSMENT REPORT
 NAS MEMPHIS
 CTO-0080

SOIL BORING B-7
 UST's 304 & 1239
 MILLINGTON, TN

DATE INSTALLED: 7/14/1994 PROJ. #: CT000

DATE: 8/4/1994 DWG NAME: CTOSBB-

DEPTH (FEET)	SAMPLE TYPE	SAMPLE DEPTH	BLOWS/5 FT	ORGANIC VALEN (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE - Crushed Limestone					
0		51			0.0-0.5' CLAYEY SILT, BROWN, SLIGHTLY MOIST, FIRM.
					0.5-3.0' CLAYEY SILT, GREYISH BROWN, SLIGHTLY MOIST, FIRM.
3		29			3.0-8.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT GRADING TO CLAYEY SILT, GREY MOTTLED BROWN, STIFF, (WITH SLIGHT HYDRO-CARBON ODOR).
5.5		27			
8		185			8.0-13.0' CLAYEY SILT, GREYISH BROWN MOTTLED GREY, MOIST, FIRM (WITH HYDROCARBON ODOR).
10.5		239			
13		306			13.0-18.0' CLAYEY SILT, GREYISH BROWN MOTTLED GREY, MOIST, FIRM (WITH HYDROCARBON ODOR).
DISCONTINUED BORING AT 18.0 FEET.					
20					
25					
30					



ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO-0080

SOIL BORING B-8
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/12/1994 PROJ. #: CTO0C

DATE: 8/4/1994

DWG NAME: CTOSBB-

DEPTH (FEET)
 SAMPLE TYPE
 SAMPLE DEPTH
 BLOWS/5 FT
 ORGANIC MATTER (ppm)

DESCRIPTION OF SUBSURFACE MATERIALS

SURFACE - Grass

0	60	0.0-3.0' CLAYEY SILT, TAN TO BROWN, SLIGHTLY MOIST, STIFF, (WITH TRACES OF SUBROUNDED GRAVEL) (FILL).
3	16	3.0-4.6' CLAYEY SILT TO SILTY CLAY, TAN AND BROWN, VERY MOIST, (WITH TRACES OF GRAVEL) (FILL?).
4.6	32	4.6-8.0' CLAYEY SILT, GREYISH BROWN WITH SOME BLACK STAINING, MOIST, SOFT (WITH SLIGHT HYDROCARBON ODOR).
8	3	8.0-10.1' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT.
10.1	3	10.1-14.7' CLAYEY SILT TO SILTY CLAY, TAN TO BROWN MOTTLED GREY, MOIST, FIRM.
13	2	
14.7	67	14.7-18.0' CLAYEY SILT, DARK BROWN, MOIST, STIFF (WITH TRACES OF FINE WET VERTICAL SEAMS OF GREY SILT)(WITH SLIGHT HYDROCARBON ODOR).
DISCONTINUED BORING AT 18.0 FEET.		
20		
25		
30		



ENVIRONMENTAL
 ASSESSMENT REPORT
 NAS MEMPHIS
 CTO-0080

SOIL BORING B-9
 UST's 304 & 1239
 MILLINGTON, TN

DATE INSTALLED: 7/12/1994 PROJ. #: CT000

DATE: 8/4/1994

DWG NAME: CTOSBB-

DEPTH (FEET)
 SAMPLE INCH
 SAMPLE DEPTH
 BLOWS/5 FT
 ORGANIC VAPOR (ppm)

DESCRIPTION OF SUBSURFACE MATERIALS

SURFACE - Grass

0	20	0.0-3.0' CLAYEY SILT, BROWN MOTTLED TAN, SLIGHTLY MOIST, STIFF (IN SITU SOIL).
3	14	3.0-8.0' CLAYEY SILT, BROWN GRADING TO BROWN MOTTLED GREY, SLIGHTLY MOIST, STIFF. (GREY MOTTLED IS SILT IN BOTTOM 1.5 FEET) (WITH SLIGHT HYDROCARBON ODOR).
5.5	21	
8	9	8.0-13.0' CLAYEY SILT, BROWN MOTTLED BEIGE, GRADING TO SILT, BROWN MOTTLED GREY, STIFF, MOIST (WITH SLIGHT HYDROCARBON ODOR).
10.5	19	
13	9	13.0-18.0' CLAYEY SILT, BROWN MOTTLED BEIGE AND LIGHT GREY, FIRM, VERY MOIST.
15.5	13	

DISCONTINUED BORING AT 18.0 FEET.



ENVIRONMENTAL
 ASSESSMENT REPORT
 NAS MEMPHIS
 CTO-0080

SOIL BORING B-10
 UST's 304 & 1239
 MILLINGTON, TN

DATE INSTALLED: 7/12/1994 PROJ. #: CTO00

DATE: 8/4/1994

DWG NAME: CTOSB-1

DEPTH (FEET)
 SAMPLE 1:11
 SAMPLE DEPTH
 BLOWS/5 FT
 ORGANIC VAPOR (ppm)

DESCRIPTION OF SUBSURFACE MATERIALS

SURFACE - Grass

0	40	0.0-3.0' CLAYEY SILT, TAN, SLIGHTLY MOIST, STIFF (IN SITU SOIL?).
3	31	3.0-8.0' CLAYEY SILT, BROWN, SLIGHTLY MOIST, STIFF.
8	25	8.0-10.5' CLAYEY SILT, BROWN MOTTLED GREY, VERY MOIST, FIRM.
10.5	15	10.5-13.0' CLAYEY SILT, GREYISH BROWN MOTTLED GREY (WITH SOME BLACK IN LOWER PORTION), VERY MOIST, FIRM.
13	32	13.0-15.5' CLAYEY SILT, TAN MOTTLED GREY, MOIST, FIRM.
15.5	16	15.5-18.0' SILTY CLAY BROWNISH GREY GRADING TO BROWN AND GREY TO DARK BROWN, MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR).
DISCONTINUED BORING AT 18.0 FEET.		



ENVIRONMENTAL
 ASSESSMENT REPORT
 NAS MEMPHIS
 CTO-0080


SOIL BORING B-11
 UST's 304 & 1239
 MILLINGTON, TN

DATE INSTALLED: 7/12/1994 PROJ. #: CT000

DATE: 8/4/1994

DWG NAME: CTOSB-1

DESCRIPTION OF SUBSURFACE MATERIALS			
DEPTH (FEET)	SAMPLE TYPE	SAMPLE DEPTH	BLOWS/5 FT. ORGANIC VAPOR (ppm)
SURFACE - Cross			
0		40	0.0-3.8' CLAYEY SILT, BROWN MOTTLED BEIGE AND DARK BROWN, SLIGHTLY MOIST, STIFF (FILL?).
3.8		234	3.8-5.8' CLAYEY SILT, GREYISH BROWN WITH BLACK STAINING, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
8		150	8.0-14.5' CLAYEY SILT, GREYISH BROWN WITH BLACK STAINING, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
13.0		137	14.5-14.7' SILT, BROWN, STIFF, DRY.
14.9		132	14.7-14.9' CLAYEY SILT, BROWN WITH BLACK STAINING, WITH TRACES OF ROUNDED GRAVEL, VERY MOIST (WITH TRACES OF OIL AND STRONG HYDROCARBON ODOR).
18		242	14.9-16.0' CLAYEY SILT TO SILTY CLAY, SLIGHTLY MOIST, VERY STIFF.
23		261	18.0-23.0' CLAYEY SILT, DARK GREYISH BROWN, MOIST, STIFF (WITH STRONG HYDROCARBON ODOR).
25		257	23.0-25.0' CLAYEY SILT, DARK BROWN, SLIGHTLY MOIST, FRIABLE (WITH HYDROCARBON ODOR).
			25.0-28.0' CLAYEY SILT, TAN MOTTLED BEIGE, SLIGHTLY MOIST, STIFF (UPPER PORTION OF SAMPLE MAY HAVE SLIGHT HYDROCARBON ODOR) (COLLECTED ANALYTICAL SAMPLE FROM 27-28').
DISCONTINUED BORING AT 28.0 FEET.			



ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO-0080

SOIL BORING B-12
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/13/1994 PROJ. #: CTO0C
DATE: 8/4/1994 DWG NAME: CTOSB-

DEPTH (FEET)
 SAMPLE TYPE
 SAMPLE DEPTH
 BLOWS/5 FT
 ORGANIC VAPOR (ppm)

DESCRIPTION OF SUBSURFACE MATERIALS

SURFACE - Grass

0	7	0.0-3.0' CLAYEY SILT, TAN TO BROWN, SLIGHTLY MOIST, FIRM TO STIFF (FILL?)
3	15	3.0-8.0' CLAYEY SILT, BROWN MOTTLED TAN, VERY MOIST, SOFT.
8	9	8.0-13.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT.
13	6	13.0-14.0' CLAYEY SILT, BROWN, WET, SOFT.
14	77	14.0-14.5' CLAYEY SILT, GREYISH BROWN WITH BLACK STAINING, WET, SOFT (WITH HYDROCARBON ODOR). 14.5-18.0' CLAYEY SILT, GREYISH BROWN GRADING TO BROWN, MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR).
18	49	18.0-21.0' CLAYEY SILT, LIGHT BROWN GRADING TO DARK BROWN, MOIST, STIFF.
20.5	300	21.0-23.0' CLAYEY SILT, DARK BROWN, VERY MOIST, FRIABLE (WITH HYDROCARBON ODOR).
23	327	23.0-26.0' CLAYEY SILT, DARK GREYISH BROWN, VERY MOIST, FIRM (WITH TRACES OF OIL AND STRONG HYDROCARBON ODOR).
25.5	18	26.0-28.0' CLAYEY SILT, BROWN MOTTLED TAN, MOIST, FIRM TO STIFF (WITH SLIGHT HYDROCARBON ODOR).

DISCONTINUED BORING AT 28.0 FEET.



ENVIRONMENTAL
 ASSESSMENT REPORT
 NAS MEMPHIS
 CTO-0080

SOIL BORING B-13


UST's 304 & 1239
 MILLINGTON, TN

DATE INSTALLED: 7/12/1994 PROJ. #: CT000

DATE: 8/4/1994

DWG NAME: CTOSB-1

DEPTH (FEET)	SAMPLE TYPE	SAMPLE DEPTH	BLOWS/ 5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE - Grass					
0		70			0.0-3.0' CLAYEY SILT, BROWN MOTTLED BEIGE, SLIGHTLY MOIST, STIFF.
3		64			3.0-8.0' CLAYEY SILT, BROWN WITH DARK BROWN STREAKS, MOIST, FIRM.
8		96			8.0-13.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH HYDROCARBON ODOR).
13		23			13.0-18.0' CLAYEY SILT, BROWN, VERY MOIST, FIRM TO SOFT (WITH SLIGHT HYDROCARBON ODOR).
DISCONTINUED BORING AT 18.0 FEET.					



ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CT00080

SOIL BORING B-14
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/13/1994 PROJ. #: CT00080
DATE: 8/4/1994 DWG NAME: CTOSB-1

DEPTH (FEET)
SAMPLE 1/1/1
SAMPLE DEPTH
BLOWS/5 FT
ORGANIC VAPOR (ppm)

DESCRIPTION OF SUBSURFACE MATERIALS

SURFACE - Grass

1	330	0.0-1.0' CLAYEY SILT, TAN MOTTLED BROWN, SLIGHTLY MOIST, STIFF.
3	213	1.0-3.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH HYDROCARBON ODOR). HIT TANK AT APPROXIMATE DEPTH OF 6 FEET, OFFSET BORING 3 FEET EAST. SAMPLES BELOW 3 FEET IN DEPTH ARE FROM OFFSET BORING.
5		3.0-8.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
8	202	8.0-13.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
13	136	13.0-18.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT TO FIRM (WITH TRACES OF CARBONIZED WOOD AND SLIGHT HYDROCARBON ODOR).
18	8	18.0-20.5' CLAYEY SILT, LIGHT GREYISH BROWN GRADING TO GREY, MOIST, FIRM.
20.5	3	20.5-23.0' SILTY CLAY, DARK GREYISH BROWN GRADING TO DARK BROWN, MOIST, STIFF.
23	2	23.0-27.0' CLAYEY SILT, BROWN, VERY MOIST, FIRM TO STIFF.
25.5	6	27.0-28.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, FIRM.
DISCONTINUED BORING AT 28.0 FEET.		



ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO-0080

SOIL BORING B-15
UST's 304 & 1239
MILLINGTON, TN

DATE INSTALLED: 7/13/1994 PROJ. #: CTO00

DATE: 8/4/1994

DWG NAME: CTO5B-1

SWMU 7





Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-1S

Project: NAS Memphis	Location: Millington, TN SHMU#7 - Building N-26
Project No.: A0094	Surface Elevation: feet msl
Started at 1015 on 2-07-95	TOC Elevation: feet msl
Completed at on 2-07-95	Depth to Groundwater: feet Measured
Drilling Method: Rotasonic	Groundwater Elevation: feet msl
Drilling Company: North Star Drilling	Total Depth: 20.0 feet
Geologist: Ben Brantley	Well Screen: 10 to 20 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PTD (ft)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft msl)	WELL DIAGRAM
5			1	80	BG			Clayey silt, grayish blue green, moist.		
10								Clayey silt, moderate brown, medium stiff.		
15			2	100	BG		ML	Clayey silt, moderate brown to dark yellowish brown, mottled pale yellowish brown.		
20								Clayey silt, light brown to reddish brown, stiff, dry.		
25			3	100	BG			Clayey silt, moderate brown, stiff.		
30								Log information taken from the boring for the Cockfield well at SHMU#7 site 1.		
35										
40										



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-1UF

Project: NAS Memphis

Location: Millington, TN SHMUN7 - Building N-126

Project No.: N0094

Surface Elevation: feet msl

Started at 1015 on 2-07-95

TOC Elevation: feet msl

Completed at on 2-07-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 40.0 feet

Geologist: Ben Brantley

Well Screen: 29 to 39 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
5			1	80	B6			Clayey silt, grayish blue green, moist.		
10								Clayey silt, moderate brown, medium stiff.		
15			2	100	B6		ML	Clayey silt, moderate brown to dark yellowish brown, mottled pale yellowish brown.		
20								Clayey silt, light brown to reddish brown, stiff, dry.		
25			3	100	B6			Clayey silt, moderate brown, stiff.		
30								Clayey sand, fine to medium, dark yellowish brown to light brown.		
35			4	95	B6		SC			
40										



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-1LF

Project: NAS Memphis

Location: Millington, TN SHMU#7 - Bldg N-26

Project No.: N0094

Surface Elevation: feet msl

Started at: 106 on 2-07-95

TOC Elevation: feet msl

Completed at: on 2-07-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 70 feet

Geologist: Ben Brantley

Well Screen: 59 to 69 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PTD (ft)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
45							SC			
50										
55			5	90	BG		GP	Gravelly sand, coarse, grayish orange to yellowish orange.		
60										
65										
70										
75			6	87	B6			Log information taken from the boring for the Cockfield well at SHMU#7 site 1		
80										



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-IUC

Project: N4S Memphis

Location: Millington, TN Building N-126

Project No.: N0094

Surface Elevation: feet msl

Started at 1015 on 2-07-95

TOC Elevation: feet msl

Completed at on 2-07-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

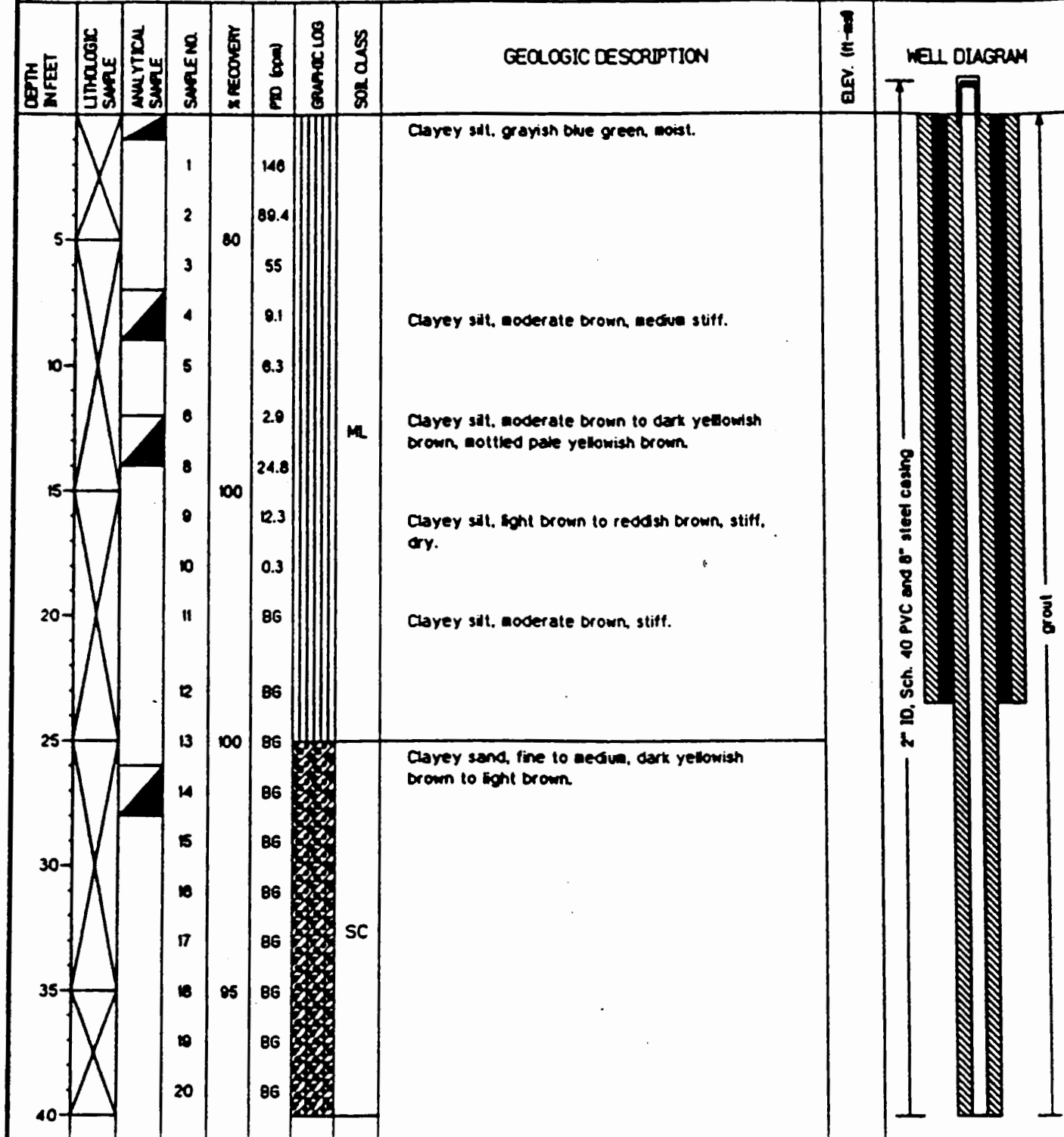
Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 40.0 feet

Geologist: Ben Brantley

Well Screen: 97 to 107 feet





Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-1UC

Project: NAS Memphis

Location: Millington, TN Building N-126

Project No.: N0094

Surface Elevation: feet *msl*

Started at: 1015 on 2-07-95

TOC Elevation: feet *msl*

Completed at: on 2-07-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet *msl*

Drilling Company: North Star Drilling

Total Depth: 101.0 feet

Geologist: Ben Brantley

Well Screen: 97 to 107 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft <i>msl</i>)	WELL DIAGRAM
45			21		BG		SC			
			22		BG					
			23		BG					
			24		BG					
			25		BG					
50			26		BG					
			27		BG			Gravelly sand, coarse, grayish orange to yellowish orange.		
55			28	90	BG					
			29		0.8					
60			30				GP			
			31		1.0					
			32		0.8					
65			33		0.8					
			34		0.8					
			35		BG			Sand clayey, fine, pale yellowish orange to moderate orange.		
70			36		BG			Silty clayey sand, fine, medium gray to olive gray, contains marcasite nodules.		
			37		BG					
75			38	87	BG		SC	Sand, fine, yellowish gray to light gray, lignite at 79.5'.		
			39		BG					
			40		BG					
80										



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-IUC

Project: NAS Memphis

Location: Millington, TN Building N-126

Project No.: M0094

Surface Elevation: feet msl

Started at 1015 on 2-07-95

TOC Elevation: feet msl

Completed at on 2-07-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 110.0 feet

Geologist: Ben Brantley

Well Screen: 97 to 107 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PIED (type)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft msl)	WELL DIAGRAM
85			41		B6			Sand, fine, medium gray to olive gray, micaceous.		
			42		B6					
			43		B6					
			44		B6			Sand, fine, light olive gray to gray with dusky brown clay lenses.		
			45		B6					
90			46		B6					
			47		B6		SC			
			48	110	B6					
			49		B6					
			50		B6			Same as above but increasing amounts of clay from 99' to 105'.		
100			51		B6					
			53		B6					
			54		B6					
105			55		B6		CL	Clay, waxy, dusky brown, hard, has olive gray sand lenses.		
			56		B6					
110			57	100	B6			End of boring at 110'.		
115										
120										



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-2S

Project: NAS Memphis

Location: Millington, TN SHMU#7 - Bldg N-26

Project No.: N0094

Surface Elevation: feet *msl*

Started at on 2-07-95

TOC Elevation: feet *msl*

Completed at on 2-07-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet *msl*

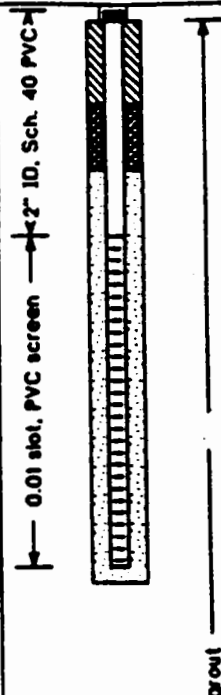
Drilling Company: North Star Drilling

Total Depth: 20.0 feet

Geologist: Ben Brantley

Well Screen: 10 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PIID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft- <i>msl</i>)	WELL DIAGRAM
5			1	90	86			Clayey silt, grayish green with dark yellow brown.		
10										
15			2	100	86		ML	Clayey silt, dark yellowish brown to light olive gray.		
								Clayey silt, dark yellowish orange to light brown, medium stiff, dry.		
20			3	100	86			Clayey silt, moderate brown with organics. End of boring at 20'.		
25										
30										
35										
40										





Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-2UC

Project: NAS Memphis	Location: Millington, TN SHALW7 - Building H-26
Project No.: N0094	Surface Elevation: feet msl
Started at 150 on 2-07-95	TOC Elevation: feet msl
Completed at on 2-07-95	Depth to Groundwater: feet Measured
Drilling Method: Rotasonic	Groundwater Elevation: feet msl
Drilling Company: North Star Drilling	Total Depth: 25.0 feet
Geologist: Ben Brantley	Well Screen: 106 to 118 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (bpi)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
5			1		B6			Clayey silt, grayish green with dark yellow brown.		<p>2" ID, Sch. 40 PVC and 8" steel casing</p> <p>grout</p>
			2	90	B6					
			3		B6					
			4		41.0					
10			5		20.0					
			6		B6		ML	Clayey silt, dark yellowish brown to light olive gray.		
15			7	100	B6					
			8		B6			Clayey silt, dark yellowish orange to light brown, medium stiff, dry.		
			9		B6					
20			10	100	B6			Clayey silt, moderate brown with organics.		
			11		B6					<p>2" ID, Sch. 40 PVC and 8" steel casing</p> <p>grout</p>
25			12	100	33.4					
			13		B6			Sandy clay, moderate reddish to light brown, medium stiff, fine.		
			14		B6					
30			15		B6		GM			
			16		B6			Silty clayey sand, medium, brown to yellowish orange, a few small gravels.		
			17	80	B6					
			18		B6					
35			19		B6					
			20		B6		GP	Sand, medium, yellowish gray to grayish orange, micaceous.		
40										



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-2UC

Project: NAS Memphis

Location: Millington, TN SHML#7 - Building N-128

Project No: M0094

Surface Elevation: feet msl

Started at 150 on 2-07-95

TOC Elevation: feet msl

Completed at on 2-07-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 125.0 feet

Geologist: Ben Brantley

Well Screen: 108 to 118 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PTD (ft)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
45			20		86					
			21		86					
			22		86					
			23		86					
			24		86					
50			25		86					
			26		86					
55			27	87	86					
			28		86					
			29		86					
60			30		86		GP			
			31		86					
65			32		86					
			33		86					
			34		86					
70			35		86					
			36		86					
75			37	90	86					
80										

Sand, coarse, gravelly, grayish orange to dark yellowish orange, gravels up to 2" in diameter.

Sand, fine, light gray to pale yellowish orange, with light gray clay lenses.

2" ID, Sch. 40 PVC and 8" steel casing

grout



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-2UC

Project: NAS Memphis

Location: Millington, TN SHMUM7 - Bldg N-128

Project No.: A0094

Surface Elevation: feet msl

Started at 1150 on 2-07-85

TOC Elevation: feet msl

Completed at on 2-07-85

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 125.0 feet

Geologist: Ben Brantley

Well Screen: 106 to 118 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
85							GP	Silty sand, fine, light olive gray to grayish brown, contains dusky brown clay lenses.		
90										
95			47	90	BG			Lignite laminations from 94'-95'.		
100							SM	Marcasite present at 98'.		
105										
110										
115			9	95	BG					
120							OL	Clay, dusky brown, hard, waxy, with thin sand laminations.		



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-2UC

Project: NAS Memphis

Location: Millington, TN SHMU#7 - Bldg N-28

Project No: A0094

Surface Elevation: feet *msl*

Started at 1250 on 2-07-95

TOC Elevation: feet *msl*

Completed at on 2-07-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet *msl*

Drilling Company: North Star Drilling

Total Depth: 125.0 feet

Geologist: Ben Brantley

Well Screen: 106 to 118 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft- <i>msl</i>)	WELL DIAGRAM
125			10	90	86		CL	End of boring at 125.		
130										
135										
140										
145										
150										
155										
160										



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-3S

Project: NAS Memphis

Location: Millington, TN SHMU#7 - Bldg N-26

Project No.: N0094

Surface Elevation: feet msl

Started at 1630 on 2-07-95

TOC Elevation: feet msl

Completed at 1500 on 2-14-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 20.0 feet

Geologist: Ben Brantley

Well Screen: 10 to 20 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (bpi)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
5			1	40	BG			Clayey silt, moderate brown to moderate yellowish brown, moist.		
10			2	120	BG		ML			
15			3	100	BG			Clayey silt, olive black, moist, soft.		
20			4	90	BG			Log information taken from the boring for the Cockfield well at SHMU#7 Site 3.		
25										
30										
35										
40										



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-3UF

Project: NAS Memphis

Location: Millington, TN SHALW7 - Building N-128

Project No.: N0094

Surface Elevation: feet msl

Started at 1530 on 2-07-95

TOC Elevation: feet msl

Completed at 1600 on 2-14-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 45.0 feet

Geologist: Ben Brantley

Well Screen: 10 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
5			1	40	86			Clayey silt, moderate brown to moderate yellowish brown, moist.		
10			2	120	86					
15			3	100	86		ML	Clayey silt, olive black, moist, soft.		
20			4	90	86			Clayey silt, dark yellowish brown, medium stiff.		
25			5	90	86			Clayey silt, moderate brown with yellow gray silt, organics.		
30			6	100	86					
35			7	100	86		SC	Clayey silt with sand, moderate brown. Silty clayey sand, yellowish orange to yellowish brown. Silty sand, yellowish orange to reddish brown, fine to medium grained.		
40			8	120	86					



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-3LF

Project: NAS Memphis

Location: Millington, TN SHAW7 - Building N-28

Project No.: N0094

Surface Elevation: feet msl

Started at 1630 on 2-07-95

TOC Elevation: feet msl

Completed at 1500 on 2-14-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 80.0 feet

Geologist: Ben Brantley

Well Screen: 69.5 to 79.5 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PTD (feet)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
5			1	40	BG			Clayey silt, moderate brown to moderate yellowish brown, moist.		
10			2	120	BG					
15			3	100	BG		ML	Clayey silt, olive black, moist, soft.		
20			4	90	BG			Clayey silt, dark yellowish brown, medium stiff.		
25			5	90	BG			Clayey silt, moderate brown with yellow gray silt, organics.		
30			6	100	BG			Clayey silt with sand, moderate brown.		
35			7	100	BG		SC	Silty clayey sand, yellowish orange to yellowish brown.		
40			8	120	BG			Silty sand, yellowish orange to reddish brown, fine to medium grained.		



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-3LF

Project: NAS Memphis

Location: Millington, TN SHMUM7 - Bldg N-28

Project No.: A0084

Surface Elevation: feet msl

Started at 1630 on 2-07-95

TOC Elevation: feet msl

Completed at 1500 on 2-14-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 80.0 feet

Geologist: Ben Brantley

Well Screen: 69.5 to 79.5 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft- msl)	WELL DIAGRAM
45			9	120	BG		SC	Sand, yellowish gray, fine.		
50								Sand, medium, yellowish orange to yellowish brown.		
55			10	75	BG			Sand, medium to coarse, grayish orange to yellow gray, with gravels.		
60							GP			
65			11	80	BG					
70										
75			12	80	BG					
80							SC	Silty sand, fine, yellowish orange to yellow gray.		

2" ID, Sch. 40 PVC and 8" steel casing

0.01 slot, PVC screen

grout

bentonite seal

10/20 sand



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-3UC

Project: NAS Memphis

Location: Millington, TN SHMUN7 - Building N-120

Project No: N0094

Surface Elevation: feet msl

Started at 1630 on 2-07-95

TOC Elevation: feet msl

Completed at 1500 on 2-14-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 15.0 feet

Geologist: Ben Brantley

Well Screen: 97 to 107 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PIED (psa)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft- msl)	WELL DIAGRAM
5			1		86			Clayey silt, moderate brown to moderate yellowish brown, moist.		
			2	40	86					
			3		86					
			4		86					
10			5	120	86					
			6		86					
			7		86					
15			8	100	86		ML	Clayey silt, olive black, moist, soft.		
			9		86					
			10		86					
20			11	90	86			Clayey silt, dark yellowish brown, medium stiff.		
			12		86					
			13		86					
25			14	90	86			Clayey silt, moderate brown with yellow gray silt, organics.		
			15		86					
30			16	100	86			Clayey silt with sand, moderate brown.		
			17		86					
			18		86			Silty clayey sand, yellowish orange to yellowish brown.		
35			19	100	86		SC	Silty sand, yellowish orange to reddish brown, fine to medium grained.		
			20		86					
40			21	120	86					



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-3UC

Project: NAS Memphis

Location: Millington, TN SHMUM7 - Bldg M-128

Project No.: M0094

Surface Elevation: feet *msl*

Started at 1630 on 2-07-95

TOC Elevation: feet *msl*

Completed at 1500 on 2-14-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet *msl*

Drilling Company: North Star Drilling

Total Depth: 15.0 feet

Geologist: Ben Brantley

Well Screen: 97 to 107 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PIED (psf)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft- <i>msl</i>)	WELL DIAGRAM
45			22		0.2		SC	Sand, yellowish gray, fine.		
			23		0.2			Sand, medium, yellowish orange to yellowish brown.		
			24	120	86			Sand, medium to coarse, grayish orange to yellow gray, with gravels.		
			25		0.2					
50			26		0.2					
			27		0.2					
			28		86					
55			29	75	86		GP			
			30		86					
60			31		86					
			32		86					
			33		86					
65			34	80	86					
			35		86					
			36		86					
70			37		86					
			38		0.2					
75			39	80	0.2					
			40		86					
80			41		86		SC	Silty sand, fine, yellowish orange to yellow gray.		
							CL			

2" ID, Sch. 40 PVC and 8" steel casing

grout



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-3UC

Project: NAS Memphis

Location: Millington, TN SHMUN7 - Bldg N-126

Project No.: N0094

Surface Elevation: feet MSL

Started at 1630 on 2-07-95

TOC Elevation: feet MSL

Completed at 1600 on 2-14-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet MSL

Drilling Company: North Star Drilling

Total Depth: 115.0 feet

Geologist: Ben Brantley

Well Screen: 97 to 107 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PIED (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
85			42		86			Clay, dusky brown to olive gray, with light gray sand.		
			43		86					
			44	105	86					
			45		86					
			46		86					
90			47		86			Lignitic from 91'-93'.		
			48		86					
			49	105	86					
95			50		86					
			51		86					
100			52		86					
			53		86					
			54	100	86			Clay, dusky brown, waxy, contains less sand.		
105			55		86					
			56		86					
110			57		86					
			58		86					
115			59	110	86			End of boring at 115'.		
120										



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-4S

Project: NAS Memphis

Location: Millington, TN SHMU#7 - Building H-26

Project No.: N0094

Surface Elevation: feet msl

Started at 0900 on 1-09-95

TOC Elevation: feet msl

Completed at 0910 on 2-16-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 20.0 feet

Geologist: Jack Carmichael

Well Screen: 10 to 20 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
5			1	62.5	BG			Clayey silt, moderate brown, stiff.		
10			2	50	BG		ML			
15			3	60	BG			Clayey silt, dark yellow brown, medium stiff, moist.		
20			4	80	BG			Clayey silt, moderate yellow with reddish brown, hard.		
25								Log information taken from the boring for the Cockfield well at SHMU#7 Site 4.		
30										
35										
40										

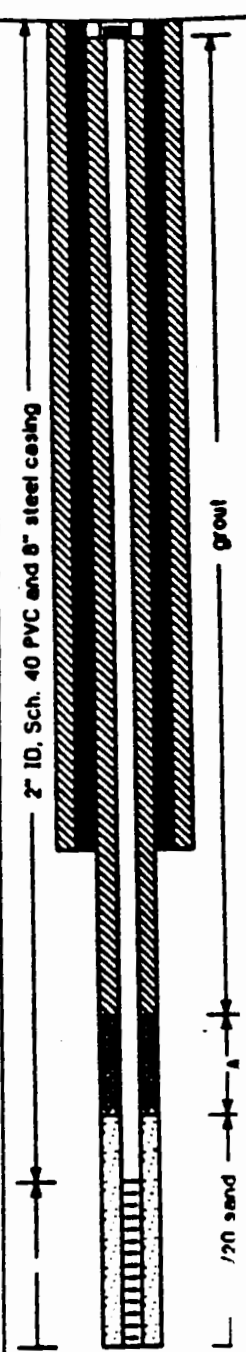


Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-4UF

Project: NAS Memphis	Location: Millington, TN SHALUF7 - Building N-26
Project No.: A0094	Surface Elevation: feet <i>msl</i>
Started at 0900 on 1-09-95	TOC Elevation: feet <i>msl</i>
Completed at 0910 on 2-15-95	Depth to Groundwater: feet Measured
Drilling Method: Rotasonic	Groundwater Elevation: feet <i>msl</i>
Drilling Company: North Star Drilling	Total Depth: 45.0 feet
Geologist: Jack Carmichael	Well Screen: 35 to 45 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PTD (top)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft- <i>msl</i>)	WELL DIAGRAM
5			1	82.5	86			Clayey silt, moderate brown, stiff.		
10			2	50	86					
15			3	80	86		ML	Clayey silt, dark yellow brown, medium stiff, moist.		
20			4	80	86			Clayey silt, moderate yellow with reddish brown, hard.		
25			5	80	86					
30								Clay, silty, trace sand, very fine, moderate reddish brown, stiff.		
35			6	110	86		SC	Sand, clayey, silty, finely micaceous, moderate reddish orange to moderate reddish brown.		
40								Sand, very fine to fine, silty, clayey, laminated, small clay casts, pale orange to moderate red.		





Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-4UF

Project: NAS Memphis

Location: Millington, TN SHMU#7 - Bldg N-28

Project No.: A0094

Surface Elevation: feet msl

Started at 0900 on 1-09-95

TOC Elevation: feet msl

Completed at 0910 on 2-16-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 45.0 feet

Geologist: Jack Carmichael

Well Screen: 35 to 45 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft- msl)	WELL DIAGRAM
45			7	105	86		SC	Sand, very fine to fine, silty, some clay, dark yellowish orange to grayish orange, wet.		
50								Log information taken from the boring for the Cockfield well at SHMU#7 Site 4.		
55										
60										
65										
70										
75										
80										



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-4LF

Project: NAS Memphis

Location: Millington, TN SHMUN7 - Building H-28

Project No.: N0094

Surface Elevation: feet msl

Started at 0900 on 1-09-95

TOC Elevation: feet msl

Completed at 0910 on 2-15-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

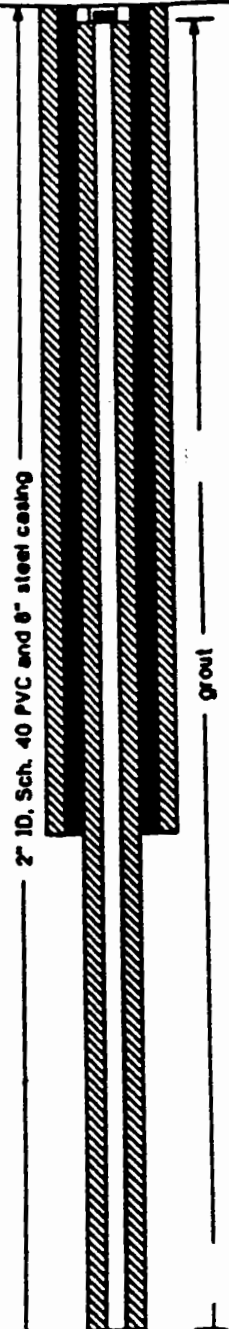
Drilling Company: North Star Drilling

Total Depth: 70.0 feet

Geologist: Jack Carmichael

Well Screen: 60 to 70 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PTD (bpm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
5			1	82.5	BG			Clayey silt, moderate brown, stiff.		
10			2	50	BG					
15			3	80	BG		ML	Clayey silt, dark yellow brown, medium stiff, moist.		
20			4	80	BG			Clayey silt, moderate yellow with reddish brown, hard.		
25			5	80	BG			Clay, silty, trace sand, very fine, moderate reddish brown, stiff.		
30								Sand, clayey, silty, finely micaceous, moderate reddish orange to moderate reddish brown.		
35			6	110	BG		SC	Sand, very fine to fine, silty, clayey, laminated, small clay casts, pale orange to moderate red.		
40										



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Monitoring Well 07-MW-4LF

Project: NAS Memphis

Location: Millington, TN SHMU#7 - Building N-26

Project No.: N0094

Surface Elevation: feet msl

Started at 0900 on 1-09-95

TOC Elevation: feet msl

Completed at 0910 on 2-15-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 70.0 feet

Geologist: Jack Carmichael

Well Screen: 60 to 70 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PIU (psi)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
45			7	105	B6		SC	Sand, very fine to fine, silty, some clay, dark yellowish orange to grayish orange, wet.		<p>2" ID, Sch. 40 PVC and 8" steel casing</p> <p>0.01 slot, PVC screen</p> <p>grout</p> <p>bentonite seal</p>
50								Sand, gravelly, clay balls, grayish orange to moderate yellowish brown.		
55			8	100	B6		GP	Sand with gravel, fine to coarse, grayish orange to moderate yellowish brown, wet.		
60										
65			9	100	B6			Gravel, sandy, moderate yellowish brown to dark yellowish orange.		
70										
75			10	100	B6					
80								Log information taken from the boring for the Cockfield well at SHMU#7 Site 4.		



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-4MC

Project: NAS Memphis	Location: Millington, TN SHALW7 - Building H-28
Project No: N0094	Surface Elevation: feet msl
Started at 0900 on 1-09-85	TOC Elevation: feet msl
Completed at 0910 on 2-16-85	Depth to Groundwater: feet Measured
Drilling Method: Rotasonic	Groundwater Elevation: feet msl
Drilling Company: North Star Drilling	Total Depth: 45.0 feet
Geologist: Jack Carmichael	Well Screen: 28 to 38 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
5			1		BG			Clayey silt, moderate brown, stiff.		
			2		BG					
			3	82.5	BG					
			4		BG					
			5		BG					
10			6	50	BG					
			7		BG					
			8		BG		ML	Clayey silt, dark yellow brown, medium stiff, moist.		
15			9	80	BG					
			10		BG			Clayey silt, moderate yellow with reddish brown, hard.		
20			11	80	BG					
			12		BG					
25			13	80	BG			Clay, silty, trace sand, very fine, moderate reddish brown, stiff.		
			14		BG					
30			15		BG			Sand, clayey, silty, finely micaceous, moderate reddish orange to moderate reddish brown.		
			16		BG					
			17		BG					
35			18	110	BG		SC	Sand, very fine to fine, silty, clayey, laminated, small clay casts, pale orange to moderate red.		
			19		BG					
40			20		BG					

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Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-4MC

Project: NAS Memphis

Location: Millington, TN SHMU#7 - Building N-28

Project No.: N0094

Surface Elevation: feet msl

Started at 0900 on 1-09-95

TOC Elevation: feet msl

Completed at 0910 on 2-16-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

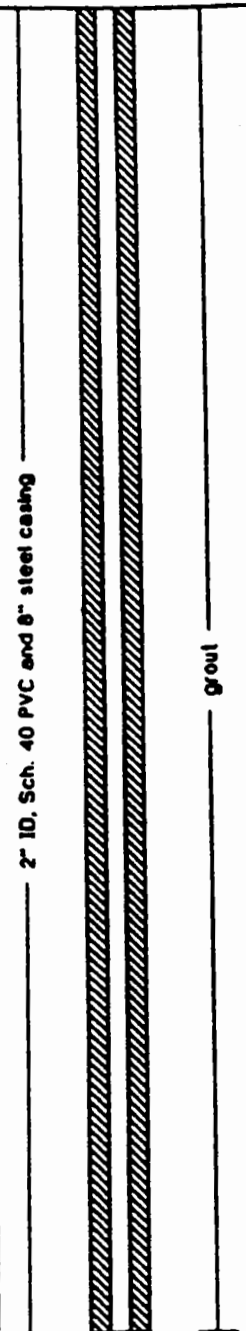
Drilling Company: North Star Drilling

Total Depth: 145.0 feet

Geologist: Jack Carmichael

Well Screen: 28 to 138 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
45			21		BG		SC	Sand, very fine to fine, silty, some clay, dark yellowish orange to grayish orange, wet.		
			22		BG					
			23	105	BG					
			24		BG			Sand, gravelly, clay balls, grayish orange to moderate yellowish brown.		
50			25		BG					
			26		BG					
			27		BG					
55			28	100	BG		GP	Sand with gravel, fine to coarse, grayish orange to moderate yellowish brown, wet.		
			29		BG					
60			30		BG					
			31		BG					
			32		BG					
65			33	100	BG			Gravel, sandy, moderate yellowish brown to dark yellowish orange.		
			34		BG					
70			35		BG					
			36		BG			Sand, very fine to fine, silty, clayey, laminated, light brownish gray to grayish brown, stiff, micaceous, moist.		
			37		BG					
75			38	100	BG		SC	Sand, very fine to fine with clay streaks, pale orange to yellowish gray stained dark yellowish orange.		
			39		BG					
80			40		BG					





Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-4MC

Project: NAS Memphis

Location: Millington, TN SHMUN7 - Building A-28

Project No.: N0084

Surface Elevation: feet msl

Started at 0900 on 1-09-95

TOC Elevation: feet msl

Completed at 0910 on 2-16-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 145.0 feet

Geologist: Jack Carmichael

Well Screen: 128 to 138 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
85			41		BG					
			42		BG					
			43	100	BG			Sand, very fine to fine, with clay streaks, yellowish gray to very pale orange, stained dark yellowish orange, very wet.		
			44		BG			Sand, very fine to fine, clayey, laminated, pale brown to moderate brown, wet.		
			45		BG			Sand, very fine to fine, laminated, medium gray to grayish brown, with occasional lignite chips.		
90			46		BG					
			47		BG					
			48	100	BG					
95			49		BG					
			50		BG					
100			51		BG		SC			
			52		BG					
			53	100	BG					
105			54		BG					
			55		BG					
110			56		BG					
			57		BG					
115			58	100	BG			Sand, very fine to fine, clayey with lignitic chips, light brownish gray to grayish brown, clayey zones are stiff, wet.		
			59		BG					
			60		BG					
120										



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-4MC

Project: NAS Memphis

Location: Millington, TN SHALUM7 - Bldg N-28

Project No: A0094

Surface Elevation: feet msl

Started at 0900 on 1-09-95

TOC Elevation: feet msl

Completed at 0910 on 2-15-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 145.0 feet

Geologist: Jack Carmichael

Well Screen: 128 to 138 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PIV (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
125			81		86					
			82		86					
			83	100	86					
			84		86					
			85		86					
130			86		86		SC			
			87		86					
			88	120	86			Sand, very fine to fine, lignitic, light brownish gray to grayish brown, cohesive in clayey zones, wet.		
135			89		86			Lignitic, dusky brown, hard.		
			90		86					
			91		86					
140			92		86		CL	Clay, silty, traces of sand, laminated dark brownish gray, color changes below 141', stiff.		
			93	100	86					
145								End of boring at 145'.		
150										
155										
160										



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-UF

Project: NAS Memphis

Location: Millington, TN SHMU7 - Building N-28

Project No: N0084

Surface Elevation: feet msl

Started at: on 1-09-95

TOC Elevation: feet msl

Completed at: on 2-21-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 45.0 feet

Geologist: Jack Carmichael

Well Screen: 35 to 45 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
5			1	75	BG			Clayey silt, moderate brown to yellowish brown, trace of organics.		
10			2	60	BG					
15			3	100	BG		ML	Clayey silt, dark yellowish brown, stiff, hard.		
20			4	90	BG					
25										
30			5	90	BG					
35			6	90	BG		SC	Sandy clay, fine, medium light brown, soft, wet. Silty sand, medium, light brown, grayish orange to yellow gray.		
40										



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-UF

Project: NAS Memphis

Location: Millington, TN SHMU#7 - Bldg H-128

Project No.: A0094

Surface Elevation: feet msl

Started at on 1-09-95

TOC Elevation: feet msl

Completed at on 2-21-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 45.0 feet

Geologist: Jack Carmichael

Well Screen: 35 to 45 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft - msl)	WELL DIAGRAM
45	X						SC	Silty sand, medium, yellowish orange to light brown.		
50								Log information taken from the boring for the Cockfield well at SHMU#7 Site 5.		
55			7	60	86					
60										
65										
70										
75										
80										



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-5LF

Project: NAS Memphis

Location: Millington, TN SHALUT - Bldg

Project No.: N0094

Surface Elevation: feet msl

Started at: on 1-09-95

TOC Elevation: feet msl

Completed at: on 2-21-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 76.0 feet

Geologist: Jack Carmichael

Well Screens: 66 to 76 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
5			1	75	86			Clayey silt, moderate brown to yellowish brown, trace of organics.		
10			2	60	86					
15			3	100	86		ML	Clayey silt, dark yellowish brown, stiff, hard.		
20			4	90	86					
25										
30			5	90	86					
35			6	90	86		SC	Sandy clay, fine, medium light brown, soft, wet. Silty sand, medium, light brown, grayish orange to yellow gray.		
40										



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-5LF

Project: NAS Memphis

Location: Millington, TN SHMU#7 - Bldg

Project No: N0084

Surface Elevation: feet msl

Started at: on 1-09-95

TOC Elevation: feet msl

Completed at: on 2-21-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

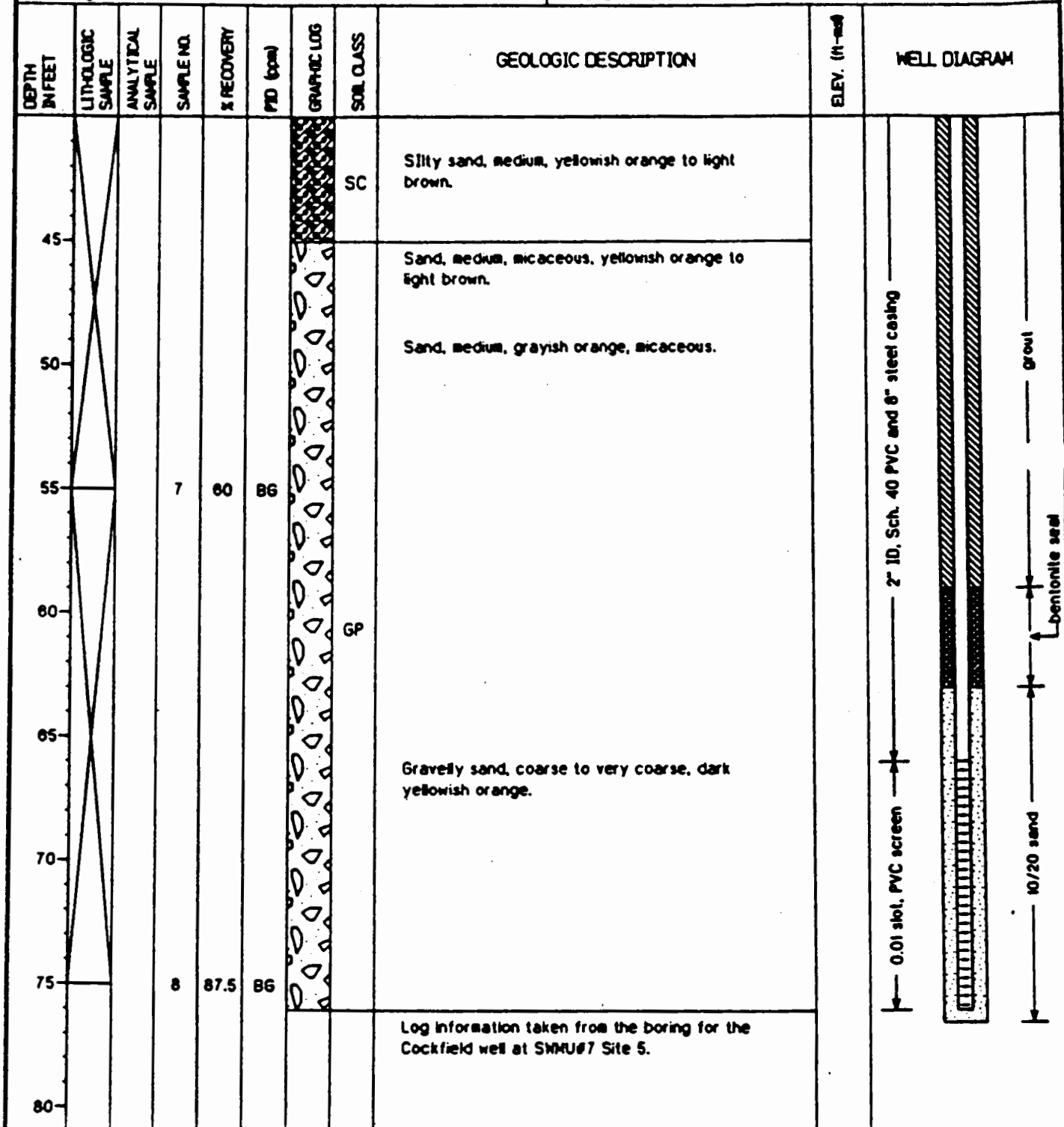
Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 76.0 feet

Geologist: Jack Carmichael

Well Screen: 68 to 76 feet





Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-5UC

Project: NAS Memphis	Location: Memphis, TN
Project No: A0094	Surface Elevation: feet msl
Started at on 1-09-95	TOC Elevation: feet msl
Completed at on 2-21-95	Depth to Groundwater: feet Measured
Drilling Method: Rotasonic	Groundwater Elevation: feet msl
Drilling Company: North Star Drilling	Total Depth: 135.0 feet
Geologist: Jack Carmichael	Well Screen: 122 to 132 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft- msl)	WELL DIAGRAM
5			1		B6			Clayey silt, moderate brown to yellowish brown, trace of organics.		
			2		B6					
			3	75	B6					
			4		B6					
10			5	80	B6					
			6		B6					
			7		B6					
15			8	100	B6			Clayey silt, dark yellowish brown, stiff, hard.		
			9		B6		ML			
			10	90	B6					
			11		B6					
			12		B6					
25			13		B6					
			14		B6					
30			15	90	B6					
			16		B6					
			17		B6			Sandy clay, fine, medium light brown, soft, wet.		
35			18	90	B6		SC	Silty sand, medium, light brown, grayish orange to yellow gray.		
			19		B6					
40			20		B6					



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-5UC

Project: NAS Memphis

Location: Memphis, TN

Project No.: A0084

Surface Elevation: feet msl

Started at: on 1-09-95

TOC Elevation: feet msl

Completed at: on 2-21-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 135.0 feet

Geologist: Jack Carmichael

Well Screen: 122 to 132 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (top)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft- msl)	WELL DIAGRAM
85			42		86					
			43		86					
			44		86					
			45		86					
90			46		86					
			47		86					
			48		86					
95			49	80	86					
			50		86					
100			51		86		SC	Sand, fine, brownish gray with dark yellow brown clay lenses.		
			52		86					
			53		86					
105			54		86					
			56		86					
110			57		86					
			58		86					
			59		86					
115			60	90	86					
			61		86					
120			62		86			Clay, dusky brown, waxy, from 119' to 119.5'. Sand, fine, brownish gray with clay lenses described above.		



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-5UC

Project: NAS Memphis

Location: Memphis, TN

Project No.: M0094

Surface Elevation: feet msl

Started at on 1-09-95

TOC Elevation: feet msl

Completed at on 2-21-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 135.0 feet

Geologist: Jack Carmichael

Well Screen: 122 to 132 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-ss)	WELL DIAGRAM
125			03		BG		SC			
			04		BG					
			05		BG					
			06		BG					
130			07		BG		CL	Clay, dusky brown, waxy, mixed with lignitic sand.		
			08		BG					
			09		BG					
135				00				End of boring at 135.		
140										
145										
150										
155										
160										



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-6S

Project: NAS Memphis

Location: Millington, TN SHMU#7 - Bldg H-28

Project No.: N0094

Surface Elevation: feet msl

Started at 0820 on 2-10-95

TOC Elevation: feet msl

Completed at 1010 on 2-14-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 20.0 feet

Geologist: Ben Brantley

Well Screen: 10 to 20 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PTD (feet)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
5			1	86	86			Fill and brick.		
10			2	70	86		ML	Clayey sil, moderate yellowish brown, mottled with yellow gray.		
15			3	70	86					
20										
25			4	80	86			Log information taken from the boring for the Cockfield well at SHMU#7 site 8.		
30										
35										
40										



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-6UF

Project: NAS Memphis

Location: Millington, TN SHMUM7 - Building N-26

Project No.: A0084

Surface Elevation: feet msl

Started at 0820 on 2-10-85

TOC Elevation: feet msl

Completed at 1010 on 2-14-85

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 55.0 feet

Geologist: Ben Brantley

Well Screen: 40 to 50 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (type)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft- msl)	WELL DIAGRAM
5			1	66	B6			Fill and brick.		
10			2	70	B6			Clayey silt, moderate yellowish brown, mottled with yellow gray.		
15			3	70	B6					
20							ML			
25			4	60	B6			Clayey silt, olive brown to olive gray, hard, stiff.		
30								Clayey silt, light brown to yellowish brown, medium stiff.		
35			5	85	B6					
40							SC	Silty clayey sand, fine to very fine, yellowish orange to reddish brown.		



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-6UF

Project: NAS Memphis	Location: Millington, TN SHMU#7 - Building N-128
Project No.: N0084	Surface Elevation: feet <i>msl</i>
Started at 0820 on 2-10-95	TOC Elevation: feet <i>msl</i>
Completed at 1010 on 2-14-95	Depth to Groundwater: feet Measured
Drilling Method: Rotasonic	Groundwater Elevation: feet <i>msl</i>
Drilling Company: North Star Drilling	Total Depth: 55.0 feet
Geologist: Ben Brantley	Well Screen: 40 to 50 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PIED (type)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft- <i>msl</i>)	WELL DIAGRAM
45			6	54	B6		SC	Silty sand, very fine to fine, traces of clay casts, grayish orange to pale yellowish orange.		
55			7	100	B6			Log information taken from the boring for the Cockfield well at SHMU#7 site 6.		
60										
65										
70										
75										
80										

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Monitoring Well 07-MW-6LF

Project: N4S Memphis	Location: Millington, TN SHMUN7 - Building N-28
Project No.: M0084	Surface Elevation: feet msl
Started at 0820 on 2-10-95	TOC Elevation: feet msl
Completed at 1010 on 2-14-95	Depth to Groundwater: feet Measured
Drilling Method: Rotasonic	Groundwater Elevation: feet msl
Drilling Company: North Star Drilling	Total Depth: 78.0 feet
Geologist: Ben Brantley	Well Screen: 67 to 77 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PTD (feet)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
5			1	88	86			Fill and brick.		
10			2	70	86			Clayey silt, moderate yellowish brown, mottled with yellow gray.		
15			3	70	86					
20							ML			
25			4	80	86			Clayey silt, olive brown to olive gray, hard, stiff.		
30								Clayey silt, light brown to yellowish brown, medium stiff.		
35			5	85	86			Silty clayey sand, fine to very fine, yellowish orange to reddish brown.		
40							SC			



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-6LF

Project: NAS Memphis

Location: Millington, TN SHALM#7 - Building H-28

Project No.: N0094

Surface Elevation: feet *msl*

Started at 0820 on 2-10-85

TOC Elevation: feet *msl*

Completed at 1010 on 2-14-85

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet *msl*

Drilling Company: North Star Drilling

Total Depth: 78.0 feet

Geologist: Ben Brantley

Well Screen: 67 to 77 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft- <i>msl</i>)	WELL DIAGRAM
45			6	54	86		SC	Silty sand, very fine to fine, traces of clay casts, grayish orange to pale yellowish orange.		
50										
55			7	100	86			Sand, fine to coarse, pale yellowish brown to moderate yellowish brown.		
60										
65			8	70	86		GP			
70										
75			9	100	86					
80								Log information taken from the boring for the Cockfield well at SHALM#7 site 8.		



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-6UC

Project: NAS Memphis

Location: Millington, TN SHMLN7 - Building N-126

Project No.: N0094

Surface Elevation: feet msl

Started at 0820 on 2-10-95

TOC Elevation: feet msl

Completed at 1010 on 2-14-95

Depth to Groundwater: feet

Measured

Drilling Method: Rotasonic

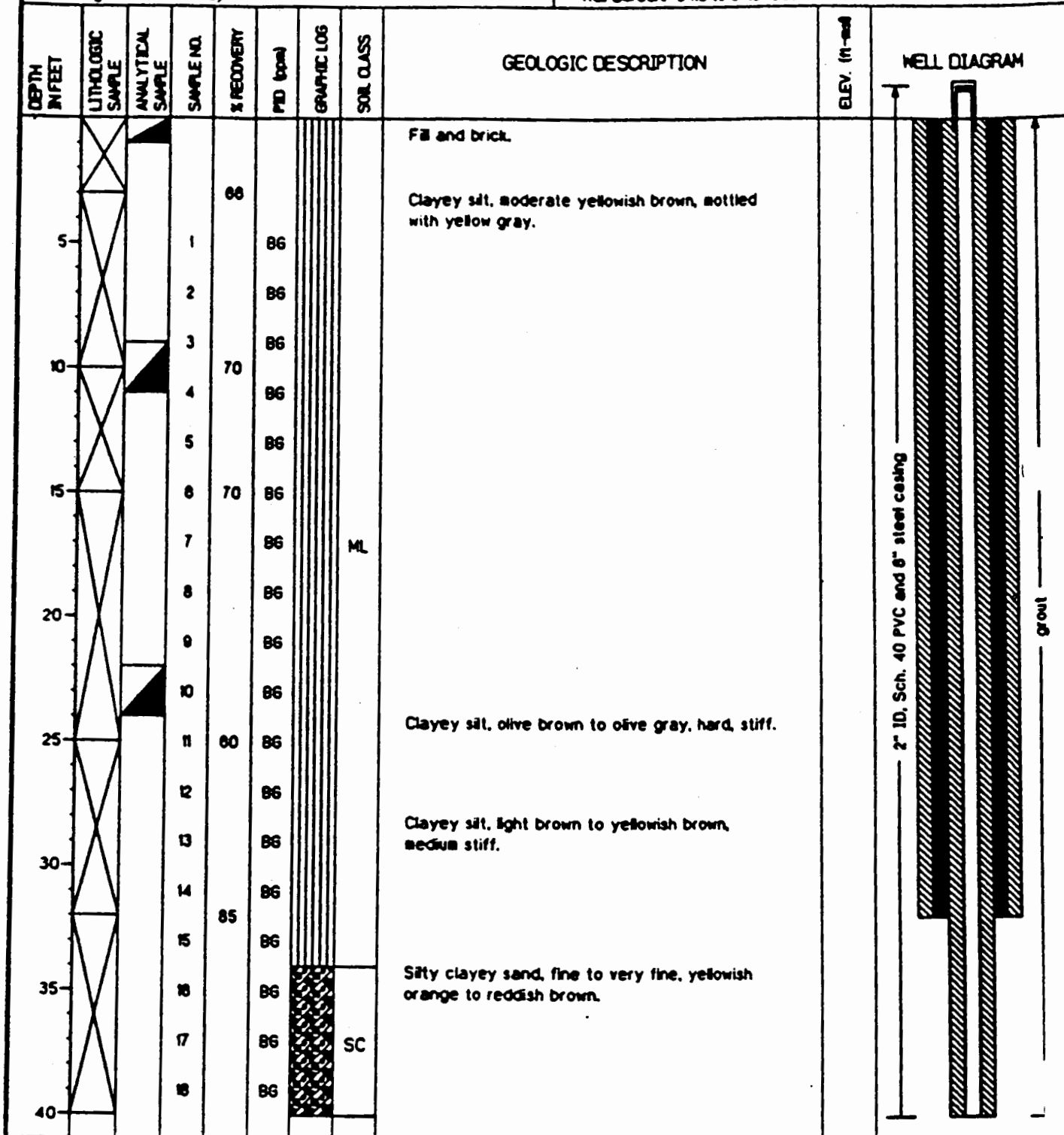
Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 101.0 feet

Geologist: Ben Brantley

Well Screen: 84.5 to 94.5 feet





Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-8UC

Project: NAS Memphis	Location: Millington, TN SHMUN7 - Bldg N-126
Project No.: M0094	Surface Elevation: feet msl
Started at 0820 on 2-10-85	TOC Elevation: feet msl
Completed at 1010 on 2-14-85	Depth to Groundwater: feet Measured
Drilling Method: Rotasonic	Groundwater Elevation: feet msl
Drilling Company: North Star Drilling	Total Depth: 1010 feet
Geologist: Ben Brantley	Well Screen: 84.5 to 94.5 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PIID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
45			18		86					
			20		86					
			21	54	86					
			22		86		SC	Silty sand, very fine to fine, traces of clay casts, grayish orange to pale yellowish orange.		
			23		86					
50			24		86					
			25		86					
55			26	100	86					
			27		86			Sand, fine to coarse, pale yellowish brown to moderate yellowish brown.		
			28		86					
60			29		86					
			30		86					
65			31	70	86		GP			
			32		86					
			33		86					
70			34		86					
			35		86					
75			36	100	86					
			37		86					
			38		86		SC	Silt clayey, finely laminated, pale yellowish orange to dark yellowish orange.		
80								Silty clay with fine sand, light brownish gray to grayish brown, micaceous, soft to stiff, moist.		

2" ID, Sch. 40 PVC and 8" steel casing

grout



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-6UC

Project: NAS Memphis

Location: Millington, TN SHMUM7 - Bldg N-28

Project No.: N0094

Surface Elevation: feet msl

Started at 0820 on 2-10-95

TOC Elevation: feet msl

Completed at 1010 on 2-14-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 101.0 feet

Geologist: Ben Brantley

Well Screen: 84.5 to 94.5 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PTD (bbl)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-ss)	WELL DIAGRAM
85			38		BG					
			40		BG					
			41	100	BG					
			42		BG		SC			
			43		BG					
90			44		BG					
			45		BG					
95			46	120	BG			Clay, interbedded very fine sand with silt, becoming more waxy.		
			47		BG		CL			
100			48		BG					
			49	120	BG			End of boring		
105										
110										
115										
120										

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Monitoring Well 07-MW-7S

Project: NAS Memphis

Location: Millington, TN SHMU#7 - Building H-28

Project No.: N0094

Surface Elevation: feet *msl*

Started at 1750 on 2-10-95

TOC Elevation: feet *msl*

Completed at on 2-14-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet *msl*

Drilling Company: North Star Drilling

Total Depth: 20.0 feet

Geologist: Ben Brantley

Well Screen: 10.0 to 20.0 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft- <i>msl</i>)	WELL DIAGRAM
5			1	125	86			Clayey silt, moderate yellowish brown, organics, mottled with yellowish gray silt.		
10			2	70	86		ML			
15			3	80	86			Clayey silt, light olive gray to olive brown, soft, moist.		
20								Log information taken from the boring for the Cockfield well at SHMU#7 site 7.		
25			4	85	86					
30										
35										
40										



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Monitoring Well 07-MW-7UF

Project: NAS Memphis

Location: Millington, TN SHALUM7 - Building N-20

Project No.: N0094

Surface Elevation: feet msl

Started at: 1750 on 2-10-95

TOC Elevation: feet msl

Completed at: on 2-14-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 50.0 feet

Geologist: Ben Brantley

Well Screen: 40.0 to 50.0 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PIED (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
5			1	125	86			Clayey silt, moderate yellowish brown, organics, mottled with yellowish gray silt.		
10			2	70	86					
15			3	80	86			Clayey silt, light olive gray to olive brown, soft, moist.		
20							ML			
25			4	85	86					
30								Silty clay, light brown to moderate yellowish brown.		
35			5	90	86					
40							SC	Silty sand, moderate yellowish brown to dark yellowish orange, stained reddish brown.		
							GP	Sand, fine to medium, silty, grayish orange to dark yellowish orange, at 39' there is some gray sand.		

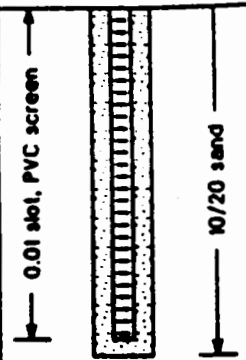


Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-7UF

Project: NAS Memphis	Location: Millington, TN SHMU#7 - Building H-128
Project No.: N0084	Surface Elevation: feet <i>msl</i>
Started at 1750 on 2-10-85	TOC Elevation: feet <i>msl</i>
Completed at on 2-14-85	Depth to Groundwater: feet Measured
Drilling Method: Rotasonic	Groundwater Elevation: feet <i>msl</i>
Drilling Company: North Star Drilling	Total Depth: 50.0 feet
Geologist: Ben Brantley	Well Screen: 40.0 to 50.0 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PTD (feet)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft- <i>msl</i>)	WELL DIAGRAM
45			6	10	86		GP			
50										
55			7	90	86			Log information taken from the boring for the Cockfield well at SHMU#7 site 7.		
60										
65										
70										
75										
80										





Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-7UC

Project: NAS Memphis

Location: Millington, TN SHMU#7 - Bldg N-28

Project No.: N0094

Surface Elevation: feet msl

Started at 1750 on 2-10-95

TOC Elevation: feet msl

Completed at on 2-14-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 105.0 feet

Geologist: Ben Brantley

Well Screen: 92.5 to 102.5 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
5			1		0.4			Clayey silt, moderate yellowish brown, organics, mottled with yellowish gray silt.		
			2	125	86					
			3		86					
			4		86					
10			5	70	86					
			6		86					
			7		86					
15			8	80	86			Clayey silt, light olive gray to olive brown, soft, moist.		
			9		86		ML			
			10		86					
			11		86					
			12		86					
25			13	85	86					
			14		86					
			15		86			Silty clay, light brown to moderate yellowish brown.		
30			16		86					
			17		86					
35			18	90	86		SC	Silty sand, moderate yellowish brown to dark yellowish orange, stained reddish brown.		
			19		86		GP	Sand, fine to medium, silty, grayish orange to dark yellowish orange, at 39' there is some gray sand.		
40										



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-7LF

Project: NAS Memphis

Location: Millington, TN SHMU#7 - Bldg N-28

Project No.: N0094

Surface Elevation: feet *msl*

Started at 1750 on 2-10-95

TOC Elevation: feet *msl*

Completed at on 2-14-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet *msl*

Drilling Company: North Star Drilling

Total Depth: 77.0 feet

Geologist: Ben Brantley

Well Screen: 68.0 to 78.0 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PIED (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft <i>msl</i>)	WELL DIAGRAM
45			6	10	86					
50										
55			7	80	86					
60							GP			
65			8	10	86			Sand and gravel, fine to very coarse grained, grayish orange to dark yellowish orange.		
70										
75			9	95	86			Sand with interdispersed clay, fine to medium grained. Clay is pinkish gray, moist.		
80								Log information taken from the boring for the Cockfield well at SHMU#7 site 7.		

2" ID, Sch. 40 PVC and 8" steel casing

0.01 slot, PVC screen

grout
bentonite seal
10/20 sand



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-7UC

Project: NAS Memphis								Location: Millington, TN SHMUM7 - Bldg M-28	
Project No: N0094								Surface Elevation: feet msl	
Started at: 1750 on 2-10-95								TOC Elevation: feet msl	
Completed at: on 2-14-95								Depth to Groundwater: feet Measured	
Drilling Method: Rotasonic								Groundwater Elevation: feet msl	
Drilling Company: North Star Drilling								Total Depth: 105.0 feet	
Geologist: Ben Brantley								Well Screen: 92.5 to 102.5 feet	

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PIED (pcf)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft- msl)	WELL DIAGRAM
5			1	125	0.4		ML	Clayey silt, moderate yellowish brown, organics, mottled with yellowish gray silt.		
			2		BG					
			3		BG					
10	4	BG								
	5	70	BG							
	6	BG								
15		7	80	BG						
		8		BG						
		9		BG						
20		10	85	BG						
		11		BG						
		12		BG						
25		13	90	BG						
		14		BG						
		15		BG						
30		16	90	BG						
		17		BG						
		18		BG						
35		19	90	BG						
		20		BG						
		21		BG						
40		22	90	BG						
		23		BG						
		24		BG						
							SC	Silty sand, moderate yellowish brown to dark yellowish orange, stained reddish brown.		
							GP	Sand, fine to medium, silty, grayish orange to dark yellowish orange, at 38' there is some gray sand.		



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-7UC

Project: NAS Memphis

Location: Millington, TN SHALUM7 - Building N-128

Project No.: N0084

Surface Elevation: feet msl

Started at: 1750 on 2-10-95

TOC Elevation: feet msl

Completed at: on 2-14-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 105.0 feet

Geologist: Ben Brantley

Well Screen: 92.5 to 102.5 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PIED (top)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft - msl)	WELL DIAGRAM
45			20		86					
			21		86					
			22	10	86					
			23		86					
			24		86					
50			25		86					
			26		86					
55			27	90	86					
			28		86					
			29		86					
60			30		86		GP	Sand and gravel, fine to very coarse grained, grayish orange to dark yellowish orange.		
			31		86					
65			32	10	86					
			33		86					
			34		86					
70			35		86			Sand with interdispersed clay, fine to medium grained. Clay is pinkish gray, moist.		
			36		86					
75			37	95	86					
			38		86					
80			39		86		SC	Sand, interbedded with clay, grayish orange, then becomes silty sand, very fine grained, clay is dark yellowish orange.		

Monitoring Well 07-MW-7UC

PROJECT: NAS MEMPHIS

Location: Millington, TN SHMU#7 - Building N-28

Project No: N0084

Surface Elevation feet msl

Started at 1750 on 2-10-96

TOC Elevations feet ASL

Completed at on 2-14-85

Depth to Groundwater: feet Measured

Drilling Method *Rotasonic*

Groundwater Elevations feet msl

Drilling Company: North Star Drilling

Total Depth 105.0 feet

Geologist: Ben Brantley

Well Screen 92.5 to 102.5 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (psal)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-ssd)	WELL DIAGRAM
85			40		B6					
			41		B6					
			42	100	B6					
			43		B6					
			44		B6					
90			45		B6		SC			
			46		B6					
			47	120	B6					
			48		B6					
			49		B6					
100			50		B6					
			51		B6		CL			
105			52	115	B6					
								End of boring at 105'.		
110										
115										
120										

— 0.01 slot, PVC screen — 2" ID, Sch. 40 PVC and 8" steel casing

grout
bentonite seal
sand
gravel



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-8UF

Project: NAS Memphis	Location: Millington, TN SHM07 - Building N-128
Project No.: N0094	Surface Elevation: feet MSL
Started at 0900 on 2-11-85	TOC Elevation: feet MSL
Completed at 1210 on 2-24-85	Depth to Groundwater: feet Measured
Drilling Method: Rotasonic	Groundwater Elevation: feet MSL
Drilling Company: North Star Drilling	Total Depth: 45 feet
Geologist: David Ladd	Well Screen: 36.0 to 46.0 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PIED (typ)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
5			1	140	BG			Clayey silt, yellowish brown, mottled yellowish gray.		
10			2	96	BG			Clayey silt, moderate brown, moist, soft.		
15			3	96	BG		ML	Clayey silt, olive gray, medium stiff to soft.		
20								Silt, light olive gray with brown mottling.		
25			4	85	BG			Silt, moderate to light brown, hard.		
30			5	80	BG			Sandy silt, moderate yellowish brown.		
35			6	120	BG		GP	Sand, fine, dark yellowish orange mottled with grayish orange, silty.		
40								Sand, pale yellowish brown.		



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-8UF

Project: NAS Memphis

Location: Millington, TN SHMU#7 - Building H-28

Project No.: N0094

Surface Elevation: feet msl

Started at 0800 on 2-11-95

TOC Elevation: feet msl

Completed at 1210 on 2-24-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 45 feet

Geologist: David Ladd

Well Screen: 36.0 to 46.0 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
45			7	80	86		GP	Log information taken from the boring for the Cockfield well at SHMU#7 site 8.		
50										
55										
60										
65										
70										
75										
80										



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-8LF

Project: NAS Memphis

Location: Millington, TN SHALM7 - Building H-28

Project No.: N0094

Surface Elevation: feet msl

Started at 0900 on 2-11-85

TOC Elevation: feet msl

Completed at 1210 on 2-24-85

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

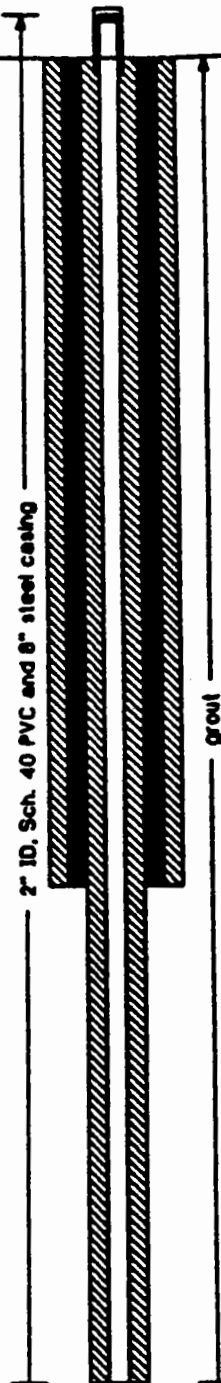
Drilling Company: North Star Drilling

Total Depth: 76 feet

Geologist: David Ladd

Well Screen: 68.0 to 78.0 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (cpa)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
5			1	140	B6			Clayey silt, yellowish brown, mottled yellowish gray.		
10			2	98	B6			Clayey silt, moderate brown, moist, soft.		
15			3	98	B6					
20							ML	Clayey silt, olive gray, medium stiff to soft.		
25			4	85	B6			Silt, light olive gray with brown mottling.		
30			5	80	B6			Silt, moderate to light brown, hard.		
35			6	120	B6			Sandy silt, moderate yellowish brown.		
40							GP	Sand, fine, dark yellowish orange mottled with grayish orange, silty.		
								Sand, pale yellowish brown.		





Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-8LF

Project: NAL Memphis

Location: Millington, TN SHMU#7 - Building H-120

Project No.: N0084

Surface Elevation: feet msl

Started at 0800 on 2-11-95

TOC Elevation: feet msl

Completed at 1210 on 2-24-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 76 feet

Geologist: David Ladd

Well Screen: 68.0 to 78.0 feet

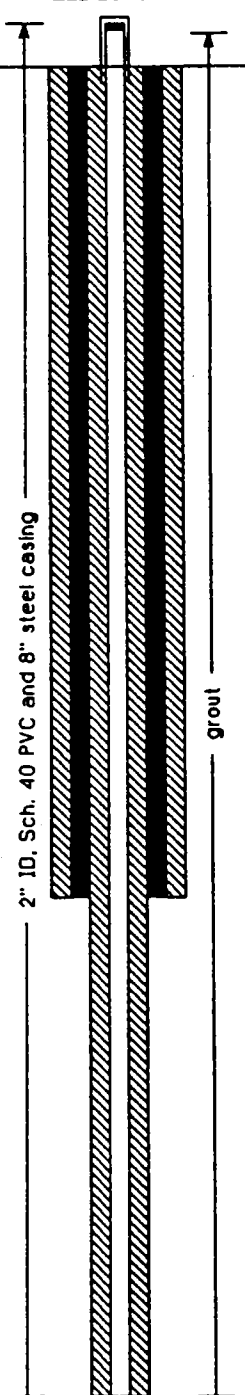
DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PTD (bore)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
45			7	80	BG			Sand, fine, grayish orange to dark yellowish orange, wet, scattered gravel.		
50										
55			8	96	BG					
60							GP			
65			9	90	BG			Sand and gravel, fine to very coarse grained, grayish orange to dark yellowish orange, gravel.		
70										
75			10	90	BG					
80								Log information taken from the boring for the Cockfield well at SHMU#7 site 8.		



Environmental & Safety Designs, Inc.

Log of Monitoring Well 07-MW-8U

Project: <i>NAS Memphis</i>	Location: <i>Millington, TN SHMUM7 - Bldg N-126</i>
Project No.: <i>ND094</i>	Surface Elevation: <i>feet msl</i>
Started at <i>0900 on 2-17-95</i>	TOC Elevation: <i>feet msl</i>
Completed at <i>1210 on 2-24-95</i>	Depth to Groundwater: <i>feet</i> Measured
Drilling Method: <i>Rotasonic</i>	Groundwater Elevation: <i>feet msl</i>
Drilling Company: <i>North Star Drilling</i>	Total Depth: <i>125 feet</i>
Geologist: <i>David Ladd</i>	Well Screen: <i>113.5 below grade to 123.5 below grade feet</i>

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
5			1		BG			Clayey silt, yellowish brown, mottled yellowish gray.		
			2		BG					
			3	140	BG			Clayey silt, moderate brown, moist, soft.		
			4		BG					
10			5	98	BG					
			6		BG					
			7		BG					
15			8	98	BG		ML	Clayey silt, olive gray, medium stiff to soft.		
			9		BG					
20			10		BG					
			11		BG			Silt, light olive gray with brown mottling.		
25				85				Silt, moderate to light brown, hard.		
			13		BG					
30			14	80	BG					
			15		BG			Sandy silt, moderate yellowish brown.		
			16		BG					
35			17	120	BG		GP	Sand, fine, dark yellowish orange mottled with grayish orange, silty.		
			18		BG			Sand, pale yellowish brown.		
40			19		BG					



Environmental & Safety Designs, Inc.

Log of Monitoring Well 07-MW-8U

Project: NAS Memphis	Location: Millington, TN SHMUM7 - Building N-126
Project No.: N0094	Surface Elevation: feet msl
Started at 0900 on 2-11-95	TOC Elevation: feet msl
Completed at 1210 on 2-24-95	Depth to Groundwater: feet Measured:
Drilling Method: Rotasonic	Groundwater Elevation: feet msl
Drilling Company: North Star Drilling	Total Depth: 125 feet
Geologist: David Ladd	Well Screen: 113.5 below grade to 123.5 below grade feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
45			20		BG			Sand, fine, grayish orange to dark yellowish orange, wet, scattered gravel.		<div>2" ID, Sch. 40 PVC and 8" steel casing</div> <div>grout</div>
			21		BG					
			22	80	BG					
			23		BG					
			24		BG					
50			25		BG					
			26		BG					
55			27	95	BG					
			28		BG		GP			
			29		BG					
60			30		BG			Sand and gravel, fine to very coarse grained, grayish orange to dark yellowish orange, gravel.		
			31		BG					
65			32	90	BG					
			33		BG					
			34		BG					
			35		BG					
70			36		BG					
			37	90	BG					
75			38		BG		SC			
			39		BG					
80								Sand, silty, very fine grained, dark yellowish orange mottled with light gray, wet.		



Environmental & Safety Designs, Inc.

Log of Monitoring Well 07-MW-8U

Project: NAS Memphis

Location: Millington, TN SHMU#7 - Bldg N-126

Project No: N0094

Surface Elevation: feet msl

Started at 0900 on 2-11-95

TOC Elevation: feet msl

Completed at 1210 on 2-24-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 125 feet

Geologist: David Ladd

Well Screen: 113.5 below grade to 123.5 below grade feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PTD (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
85			40		BG					
			41		BG			Sand, silty, very fine grained, dark yellowish orange to very pale orange.		
			42	85	BG					
			43		BG			Sand, silty, very fine grained, dark yellowish orange mottled with light gray, interbedded with gray clay, wet from 94'-95'.		
90			44		BG					
			45		BG					
			46		BG					
95			47	100	BG			Sand with interbedded clay, very fine, dusky brown to moderate brown, mottled with light olive gray, rare marcasite nodules.		
			48		BG					
			49		BG					
100			50		BG		SC			
			51		BG					
105			52	110	BG					
			53		BG					
			54		BG					
110			55		BG					
			56		BG					
115			57	110	BG					
			58		BG					
			59		BG					
120										

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Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-9S

Project: NAS Memphis

Location: Millington, TN SHMU#7 - Bldg H-28

Project No: N0094

Surface Elevation: feet msl

Started at 1650 on 2-11-85

TOC Elevation: feet msl

Completed at on 2-25-85

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

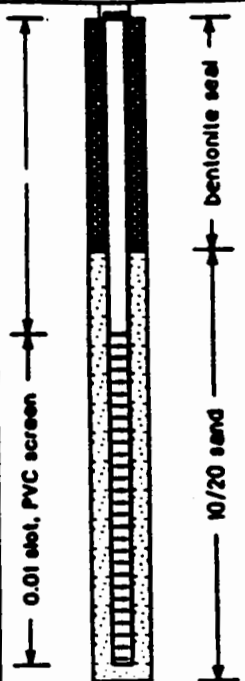
Drilling Company: North Star Drilling

Total Depth: 20.5 feet

Geologist: Ben Brantley

Well Screen: 10 to 20 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
5			1	100	86			Clayey silt, moderate brown with yellow gray streaks, moist, soft.		
10			2	70	86		ML			
15			3	100	86			Silty clay, reddish brown, stiff and plastic.		
20								Clayey silt, light brown with clay inclusions.		
25			4	85	86			Log information taken from the boring for the Cockfield well at SHMU#7 site 9.		
30										
35										
40										





Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-9UF

Project: NAS Memphis

Location: Millington, TN SHALUF - Bldg N-128

Project No.: M0094

Surface Elevation: feet MSL

Started at 1550 on 2-11-95

TOC Elevation: feet MSL

Completed at on 2-25-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet MSL

Drilling Company: North Star Drilling

Total Depth: 42 feet

Geologist: Ben Brantley

Well Screen: 32 to 42 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
5			1	100	86			Clayey silt, moderate brown with yellow gray streaks, moist, soft.		
10			2	70	86					
15			3	100	86					
20							ML	Silty clay, reddish brown, stiff and plastic.		
25			4	95	86			Clayey silt, light brown with clay inclusions.		
30								Silty clay, moderate brown to reddish brown.		
35			5	80	86		GP	Sand, fine, yellow orange to light brown.		
40								Sand, medium, yellowish gray, micaceous.		



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-9UF

Project: NAS Memphis

Location: Millington, TN SHMU#7 - Bldg H-28

Project No.: N0094

Surface Elevation: feet msl

Started at 1550 on 2-11-95

TOC Elevation: feet msl

Completed at on 2-25-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 42 feet

Geologist: Ben Brantley

Well Screen: 32 to 42 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PTD (top)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft- msl)	WELL DIAGRAM
45	X		6	95	86		SP	Log information taken from the boring for the Cockfield well at SHMU#7 site 9.		
50										
55										
60										
65										
70										
75										
80										



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-9LF

Project: NAS Memphis	Location: Millington, TN SHMUM7 - Building H-28
Project No.: N0094	Surface Elevation: feet <i>msl</i>
Started at: 1550 on 2-11-95	TOC Elevation: feet <i>msl</i>
Completed at: on 2-25-95	Depth to Groundwater: feet Measured
Drilling Method: Rotasonic	Groundwater Elevation: feet <i>msl</i>
Drilling Company: North Star Drilling	Total Depth: 77 feet
Geologist: Ben Brantley	Well Screen: 67 to 77 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft- <i>msl</i>)	WELL DIAGRAM
5			1	100	86			Clayey silt, moderate brown with yellow gray streaks, moist, soft.		
10			2	70	86					
15			3	100	86					
20										
25			4	95	86					
30										
35			5	80	86					
40										



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-9LF

Project: NAS Memphis

Location: Millington, TN SHMU#7 - Building H-28

Project No.: A0094

Surface Elevation: feet msl

Started at 1550 on 2-11-85

TOC Elevation: feet msl

Completed at on 2-25-85

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 77 feet

Geologist: Ben Brantley

Well Screen: 67 to 77 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (psd)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
45			6	95	86					
50										
55										
60										
65			7	80	88					
70										
75							SC	Silty sand, very fine, yellowish orange banded with yellowish gray.		
80								Log information taken from the boring for the Cockfield well at SHMU#7 site 8.		



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-9MC

Project: NAS Memphis

Location: Millington, TN SHALUT - Bldg N-28

Project No: A0004

Surface Elevation: feet *msl*

Started at 1550 on 2-11-85

TOC Elevation: feet *msl*

Completed at on 2-25-85

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet *msl*

Drilling Company: North Star Drilling

Total Depth: 45 feet

Geologist: Ben Brantley

Well Screens: 102 to 112 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (top)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft- <i>msl</i>)	WELL DIAGRAM
5			1		B6			Clayey silt, moderate brown with yellow gray streaks, moist, soft.		
			2	100	B6					
			3		B6					
10			4	70	B6					
			5		B6					
			6		B6					
15			7	100	B6					
			8		B6		ML	Silty clay, reddish brown, stiff and plastic.		
			9		B6			Clayey silt, light brown with clay inclusions.		
20			10		B6					
			11		B6					
25			12	95	B6			Silty clay, moderate brown to reddish brown.		
			13		B6					
30			14		B6					
			15		B6					
35			16		B6			Sand, fine, yellow orange to light brown.		
			17	80	B6		GP			
			18		B6					
40			19		B6			Sand, medium, yellowish gray, micaceous.		



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-9MC

Project: N4S Memphis

Location: Hillington, TN SHALM7 - Building N-120

Project No.: N0094

Surface Elevation: feet msl

Started at 1550 on 2-11-95

TOC Elevation: feet msl

Completed at on 2-25-95

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet msl

Drilling Company: North Star Drilling

Total Depth: 115 feet

Geologist: Ben Brantley

Well Screen: 102 to 112 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PIED (top)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-MSL)	WELL DIAGRAM
45			20		86					
			21		86					
			22	95	86					
			23		86					
			24		86					
50			25		86					
			26		86					
			27		86					
			28		86		GP			
			29		86					
60			30		86			Sand, Coarse to gravelly, grayish orange to yellowish orange.		
			31		86					
			32	90	86					
			33		86					
			34		86					
70			35		86					
			36		86					
			37		86		SC	Silty sand, very fine, yellowish orange banded with yellowish gray.		
75			38		86					
			39		86			Clayey silty sand, grayish brown, dusky brown layers of clay with light gray sand.		
80										



Environmental & Safety Designs, Inc.

Monitoring Well 07-MW-9MC

Project: NAS Memphis

Location: Millington, TN SHMUM7 - Building N-28

Project No.: N0094

Surface Elevation: feet *msl*

Started at 1550 on 2-11-85

TOC Elevation: feet *msl*

Completed at on 2-25-85

Depth to Groundwater: feet Measured

Drilling Method: Rotasonic

Groundwater Elevation: feet *msl*

Drilling Company: North Star Drilling

Total Depth: 115 feet

Geologist: Ben Brantley

Well Screen: 102 to 112 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PIED (psf)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft- <i>msl</i>)	WELL DIAGRAM
85			40		86					
			41		86					
			42	95	86					
			43		86					
			44		86					
90			45		86					
			46		86					
			47		86					
95			48		86		SC			
			49		86					
			50		86					
			51		86					
100			52	90	86					
			53		86					
			54		86					
105			55		86					
			56		86		CL	Clay, dusky brown, hard and waxy, with medium gray sand lenses.		
110			57	110	86			End of boring at 115'.		
115										
120										



Measurement of Hydraulic Conductivity

Client: EnSafe/Allen & Hoshall

Date of Report: 03/17/95

Project No.: E-2-837

Project Name: NAS Memphis, Tennessee

Sample I.D.: 007S000177

Soil Description: Yellow & light Gray Silt with fine sand

	<u>Pre-Test</u>	<u>Post Test</u>
Wet Density (Lbs/ft ³)	118.6	120.8
Dry Density (Lbs/ft ³)	101.0	101.9
Moisture (% Dry Wt)	17.4	18.6
Porosity (n)	.397	.383
Degree of Saturation (%)	.97	1.0

Permeability

Temperature Correction, $R_t = 1.048$

$$\begin{aligned}K_1 &= 6.7 \times 10^{-5} \text{ cm/sec} \\K_2 &= 6.4 \times 10^{-5} \text{ cm/sec} \\K_3 &= 6.8 \times 10^{-5} \text{ cm/sec} \\K_4 &= 6.2 \times 10^{-5} \text{ cm/sec}\end{aligned}$$

Coefficient of Permeability, $K_{20} = 6.8 \times 10^{-5} \text{ cm/sec}$

Tested in accordance with Method 9100 of Test Methods for evaluation Solid Waste, Third Addition (SW-846) and in general accordance with ASTM D-5084-90.

Lab No. P-95-0019

Reviewed By:


David D. McCray



INTERSTATE TESTING SERVICES, INC.

Measurement of Hydraulic Conductivity

Client: EnSafe/Allen & Hoshall

Date of Report: 03/17/95

Project No.: E-2-837

Project Name: NAS Memphis, Tennessee

Sample I.D.: 07S0001112

Soil Description: Dark Brown Clay with Silt & fine
sand lenses running horizontal

	<u>Pre-Test</u>	<u>Post Test</u>
Wet Density (Lbs/ft ³)	105.6	108.0
Dry Density (Lbs/ft ³)	80.2	78.6
Moisture (% Dry Wt)	31.7	37.4
Porosity (n)	.506	.516
Degree of Saturation (%)	.96	1.0

Permeability

Temperature Correction, $R_t = 1.043$

$$\begin{aligned}K_1 &= 3.7 \times 10^{-8} \text{ cm/sec} \\K_2 &= 4.2 \times 10^{-8} \text{ cm/sec} \\K_3 &= 3.9 \times 10^{-8} \text{ cm/sec} \\K_4 &= 3.9 \times 10^{-8} \text{ cm/sec}\end{aligned}$$

Coefficient of Permeability, $K_{20} = 4.1 \times 10^{-8} \text{ cm/sec}$

Tested in accordance with Method 9100 of Test Methods for
evaluation Solid Waste, Third Addition (SW-846) and in general
accordance with ASTM D-5084-90.

Lab No. P-95-0018

Reviewed By:


David D. McCray



Measurement of Hydraulic Conductivity

Client: EnSafe/Allen & Hoshall

Date of Report: 03/13/95

Project No.: E-2-837

Project Name: NAS Memphis, Tennessee

Sample I.D.: 007S0003117

Soil Description: Dark Brown Clay with Silt & fine
sand lenses running horizontal

	<u>Pre-Test</u>	<u>Post Test</u>
Wet Density (Lbs/ft ³)	98.0	103.2
Dry Density (Lbs/ft ³)	75.3	73.8
Moisture (% Dry Wt)	30.1	39.9
Porosity (n)	.544	.554
Degree of Saturation (%)	.67	.95

Permeability

Temperature Correction, $R_t = 1.086$

$$\begin{aligned}K_1 &= 1.4 \times 10^{-8} \text{ cm/sec} \\K_2 &= 1.4 \times 10^{-8} \text{ cm/sec} \\K_3 &= 1.7 \times 10^{-8} \text{ cm/sec} \\K_4 &= 1.3 \times 10^{-8} \text{ cm/sec}\end{aligned}$$

Coefficient of Permeability, $K_{20} = 1.6 \times 10^{-8} \text{ cm/sec}$

Tested in accordance with Method 9100 of Test Methods for
evaluation Solid Waste, Third Addition (SW-846) and in general
accordance with ASTM D-5084-90.

Lab No. P-95-0014

Reviewed By:


David D. McCray



Measurement of Hydraulic Conductivity

Client: EnSafe/Allen & Hoshall

Date of Report: 03/17/95

Project No.: E-2-837

Project Name: NAS Memphis, Tennessee

Sample I.D.: 07S0008127

Soil Description: Dark Brown Clay with Silt & fine sand lenses

	<u>Pre-Test</u>	<u>Post Test</u>
Wet Density (Lbs/ft ³)	104.9	109.7
Dry Density (Lbs/ft ³)	81.1	82.0
Moisture (% Dry Wt)	29.3	33.7
Porosity (n)	.497	.504
Degree of Saturation (%)	.91	1.0

Permeability

Temperature Correction, $R_t = 1.053$

$$\begin{aligned}K_1 &= 8.7 \times 10^{-7} \text{ cm/sec} \\K_2 &= 7.6 \times 10^{-7} \text{ cm/sec} \\K_3 &= 8.4 \times 10^{-7} \text{ cm/sec} \\K_4 &= 8.5 \times 10^{-7} \text{ cm/sec}\end{aligned}$$

Coefficient of Permeability, $K_{20} = 8.7 \times 10^{-7} \text{ cm/sec}$

Tested in accordance with Method 9100 of Test Methods for evaluation Solid Waste, Third Addition (SW-846) and in general accordance with ASTM D-5084-90.

Lab No. P-95-0017

Reviewed By:

David D. McCray



INTERSTATE TESTING SERVICES, INC.

Measurement of Hydraulic Conductivity

Client: EnSafe/Allen & Hoshall

Date of Report: 03/13/95

Project No.: E-2-837

Project Name: NAS Memphis, Tennessee

Sample I.D.: 007S000922

Soil Description: Brown Silty Clay

	<u>Pre-Test</u>	<u>Post Test</u>
Wet Density (Lbs/ft ³)	119.9	121.1
Dry Density (Lbs/ft ³)	94.0	95.4
Moisture (% Dry Wt)	27.5	26.9
Porosity (n)	.430	.420
Degree of Saturation (%)	.963	.980

Permeability

Temperature Correction, $R_t = 1.056$

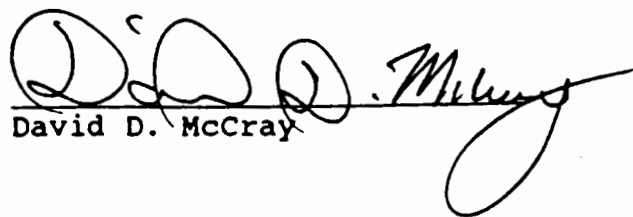
$$\begin{aligned}K_1 &= 6.9 \times 10^{-7} \text{ cm/sec} \\K_2 &= 1.0 \times 10^{-6} \text{ cm/sec} \\K_3 &= 9.7 \times 10^{-7} \text{ cm/sec} \\K_4 &= 9.2 \times 10^{-7} \text{ cm/sec}\end{aligned}$$

Coefficient of Permeability, $K_{20} = 9.5 \times 10^{-7} \text{ cm/sec}$

Tested in accordance with Method 9100 of Test Methods for evaluation Solid Waste, Third Addition (SW-846) and in general accordance with ASTM D-5084-90.

Lab No. P-95-0016

Reviewed By:


David D. McCray



Measurement of Hydraulic Conductivity

Client: EnSafe/Allen & Hoshall

Date of Report: 03/13/95

Project No.: E-2-837

Project Name: NAS Memphis, Tennessee

Sample I.D.: 008MW025

Soil Description: Dark Brown Silty Clay

	<u>Pre-Test</u>	<u>Post Test</u>
Wet Density (Lbs/ft ³)	126.0	128.4
Dry Density (Lbs/ft ³)	100.1	101.8
Moisture (% Dry Wt)	25.9	26.1
Porosity (n)	.396	.384
Degree of Saturation (%)	1.0	1.0

Permeability

Temperature Correction, $R_t = 1.086$

$$\begin{aligned}K_1 &= 5.9 \times 10^{-7} \text{ cm/sec} \\K_2 &= 1.6 \times 10^{-7} \text{ cm/sec} \\K_3 &= 1.6 \times 10^{-7} \text{ cm/sec} \\K_4 &= 2.0 \times 10^{-7} \text{ cm/sec}\end{aligned}$$

Coefficient of Permeability, $K_{20} = 3.0 \times 10^{-8} \text{ cm/sec}$

Tested in accordance with Method 9100 of Test Methods for evaluation Solid Waste, Third Addition (SW-846) and in general accordance with ASTM D-5084-90.

Lab No. P-95-0015

Reviewed By:


David D. McCray



Measurement of Hydraulic Conductivity

Client: EnSafe/Allen & Hoshall

Date of Report: 02/27/95

Project No.: E-2-837

Project Name: NAS Memphis, Tennessee

Sample I.D.: 0600S0003022

Soil Description: Gray Silty Clay

	<u>Pre-Test</u>	<u>Post Test</u>
Wet Density (Lbs/ft ³)	127.1	124.6
Dry Density (Lbs/ft ³)	104.9	100.6
Moisture (% Dry Wt)	21.2	23.8
Porosity (n)	.366	.361
Degree of Saturation (%)	.97	.99

Permeability

Temperature Correction, $R_t = 1.043$

$$\begin{aligned}K_1 &= 2.2 \times 10^{-7} \text{ cm/sec} \\K_2 &= 1.0 \times 10^{-7} \text{ cm/sec} \\K_3 &= 1.7 \times 10^{-7} \text{ cm/sec} \\K_4 &= 1.6 \times 10^{-7} \text{ cm/sec}\end{aligned}$$

Coefficient of Permeability, $K_{20} = 1.7 \times 10^{-7} \text{ cm/sec}$

Tested in accordance with Method 9100 of Test Methods for evaluation Solid Waste, Third Addition (SW-846) and in general accordance with ASTM D-5084-90.

Lab No. P-95-0011

Reviewed By:


David D. McCray



TESTING SERVICES, INC.

Report of Laboratory Analysis

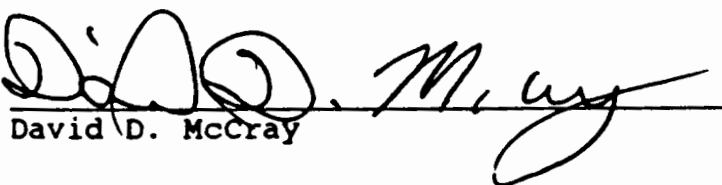
EnSafe/Allen & Hoshall
5720 Summer Trees Drive, Suite 8
Memphis, Tennessee 38134

Project No.: E-2-837
Date: 13 March '95
Sheet 1 of 1

Project: NAVY CLEAN Memphis, Tennessee

Sample Identification	007S0003117	008MW025	007S000922
Percent Moisture (as received)	30.1%	25.9%	27.5%
Bulk Density Wet (as received) LBS/ft ³	98.0	126.0	119.9
Bulk Density Dry (as received) LBS/ft ³	75.3	100.1	94.0
Specific Gravity	2.65	2.64	2.64

Reviewed by:


David D. McCray



Report of Laboratory Analysis

EnSafe/Allen & Hoshall
5720 Summer Trees Drive, Suite 8
Memphis, Tennessee 38134

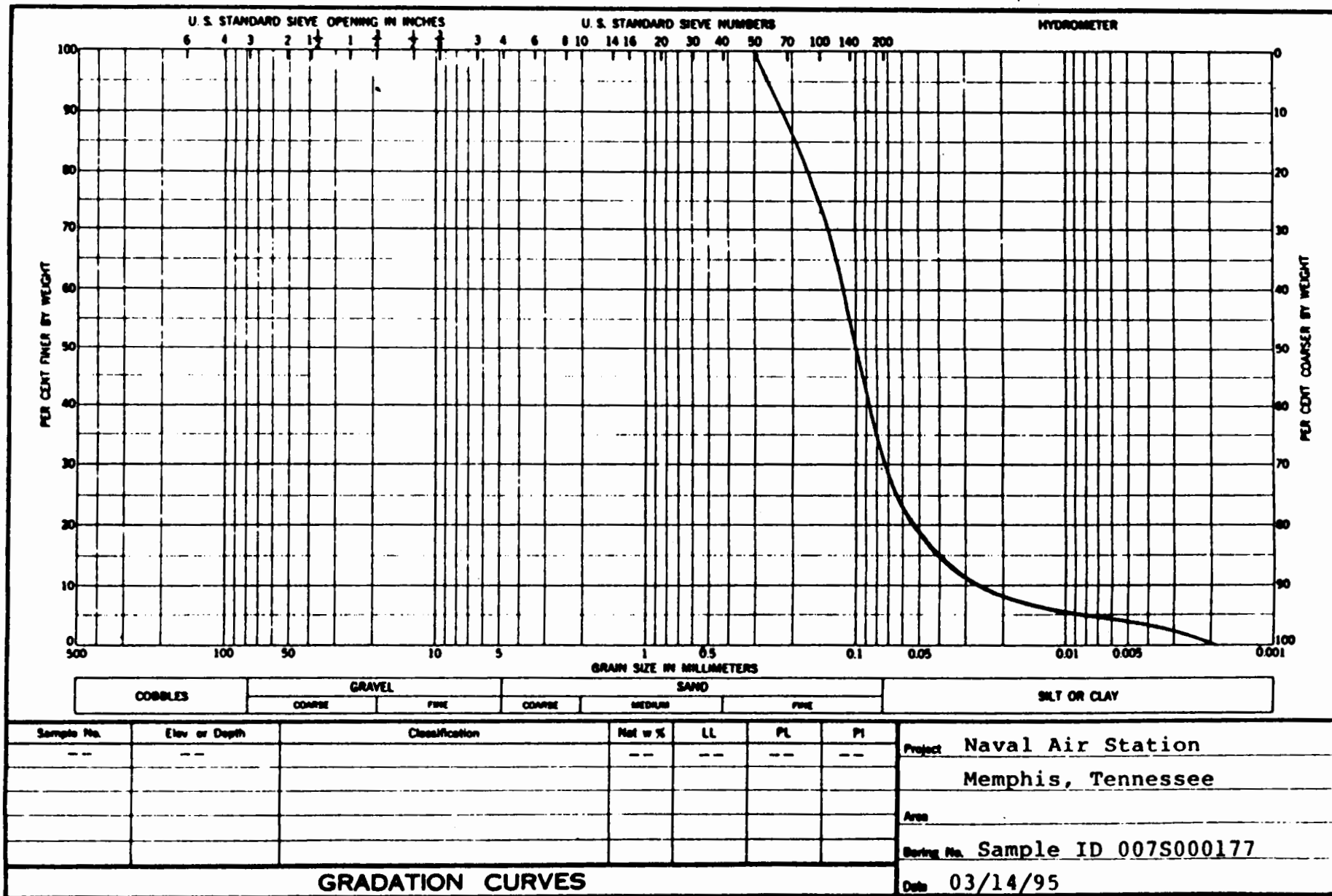
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Date: 17 March '95
Sheet 1 of 1

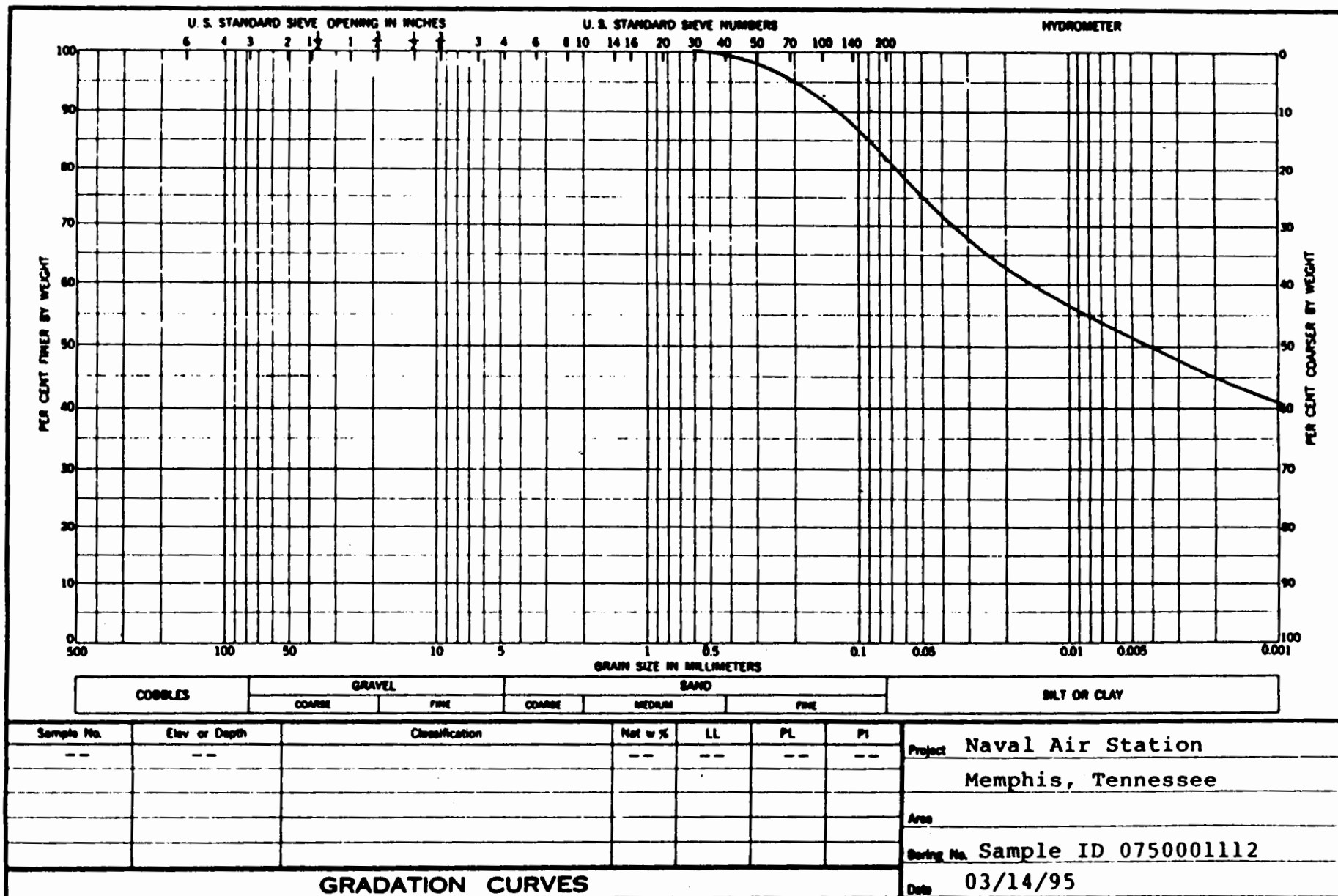
Project: NAVY CLEAN Memphis, Tennessee

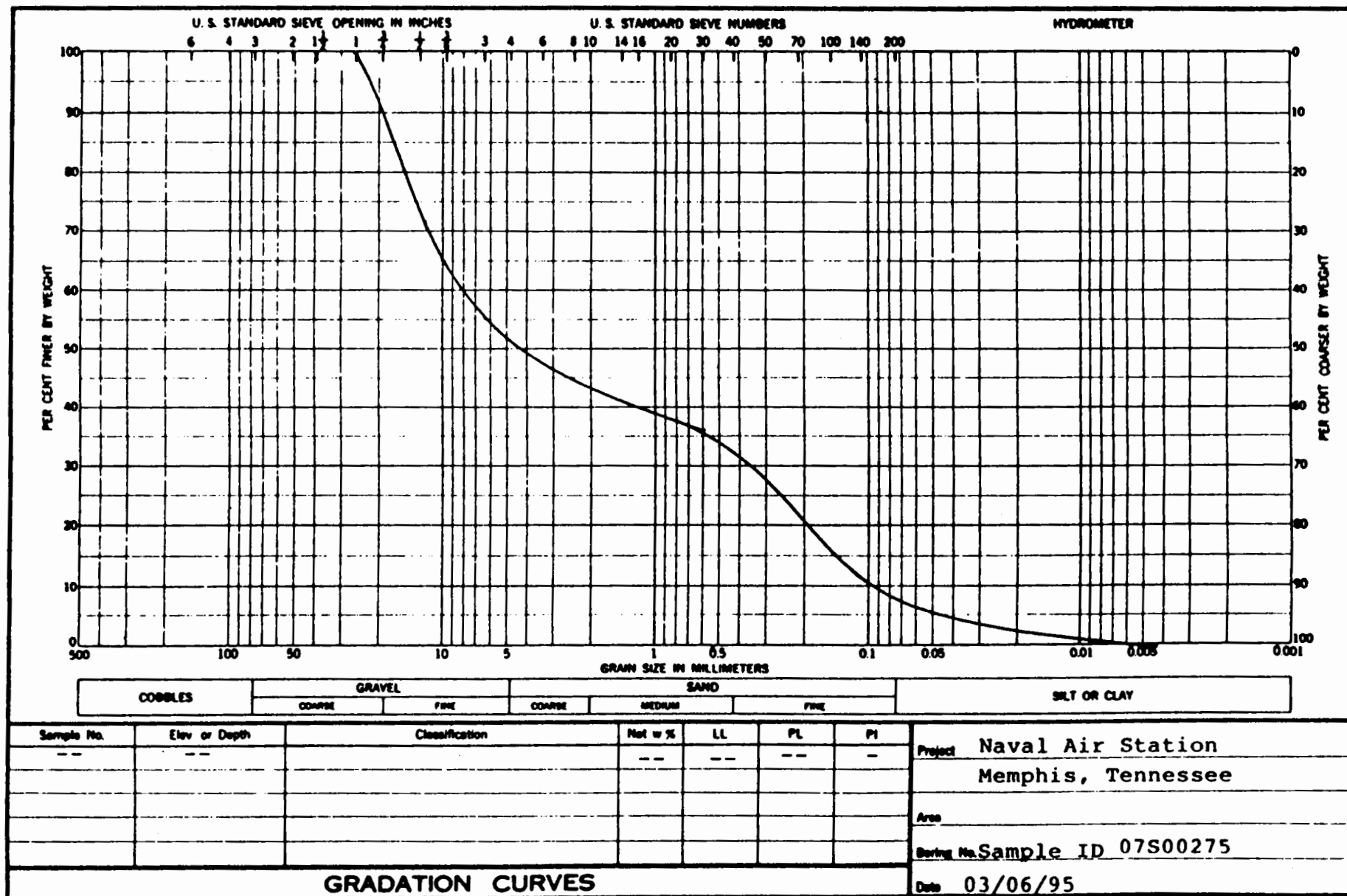
Sample Identification	07S0008127	07S0001112	007S000177
Percent Moisture (as received)	29.3%	31.7%	17.4%
Bulk Density Wet (as received) LBS/ft ³	104.9	105.6	118.6
Bulk Density Dry (as received) LBS/ft ³	81.1	80.2	101.0
Specific Gravity	2.65	2.65	2.63

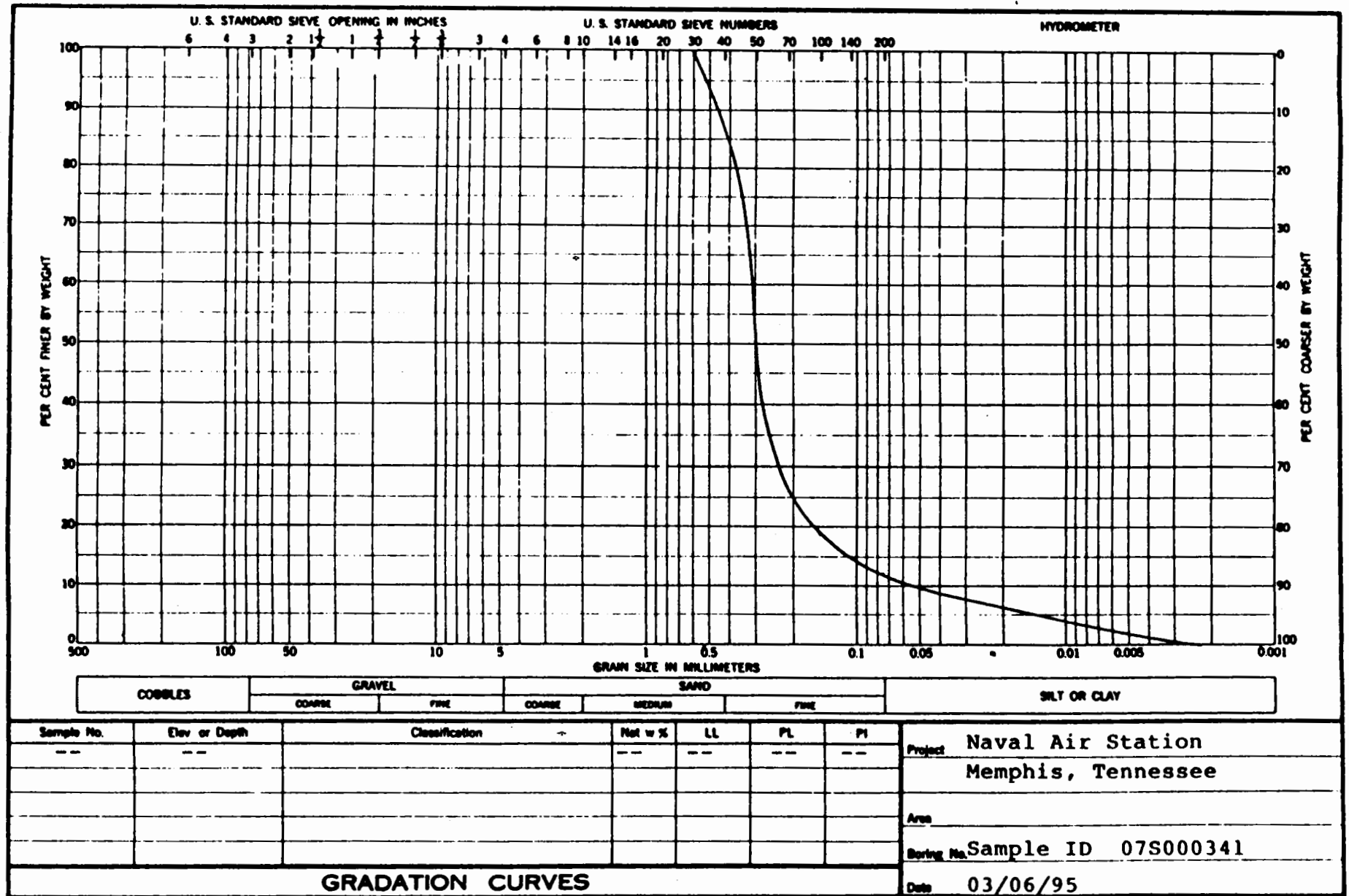
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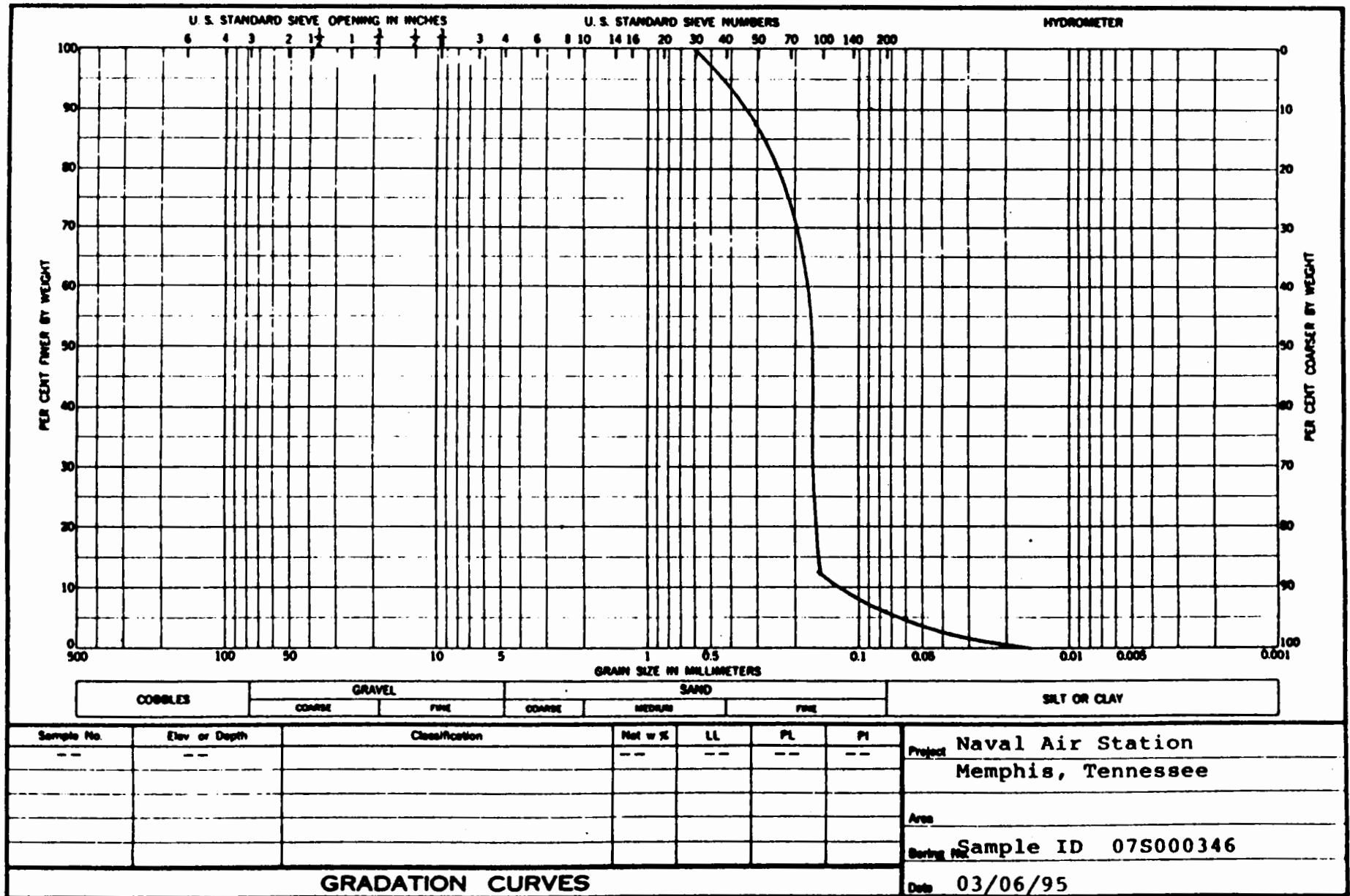

David D. McCray

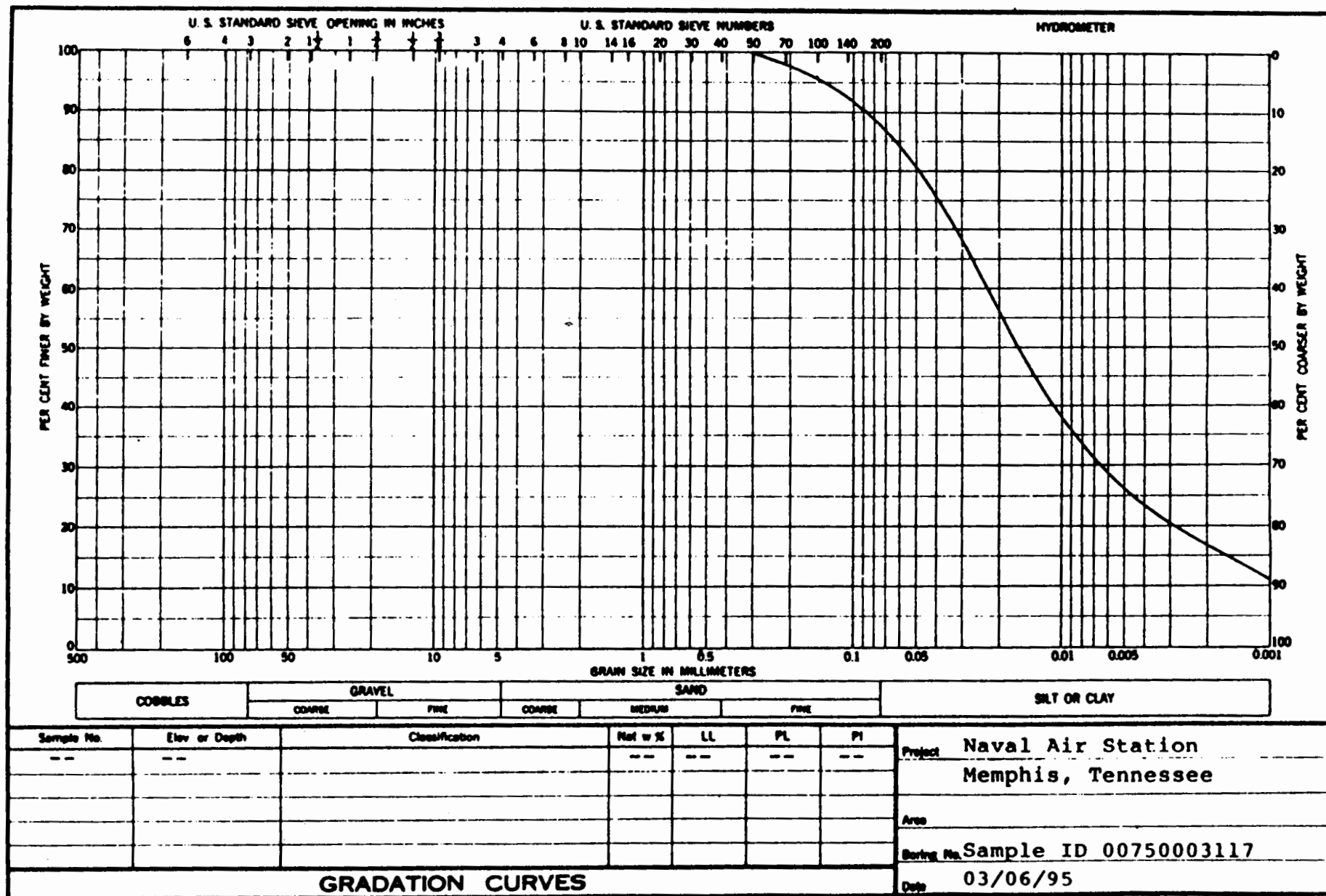


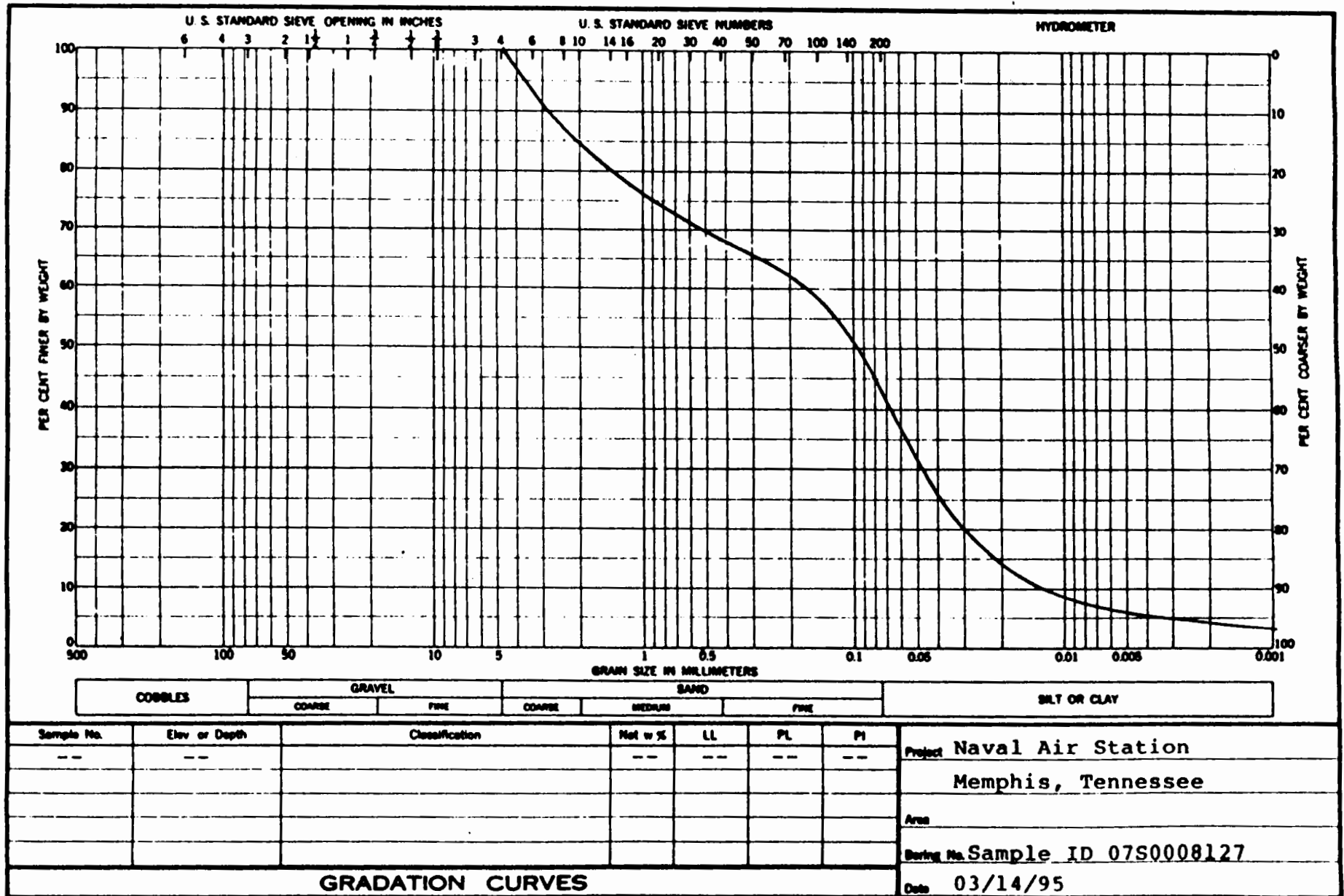


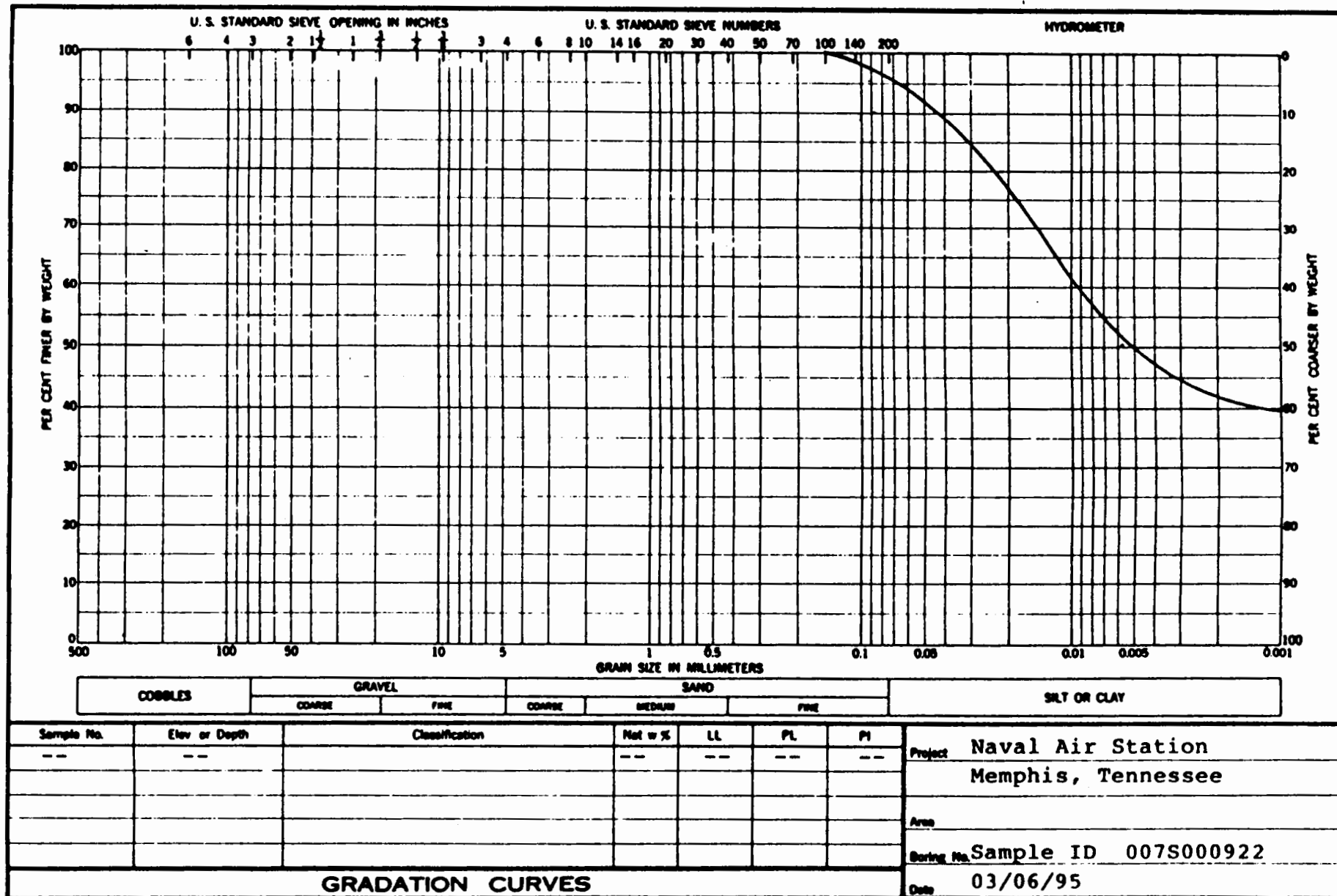


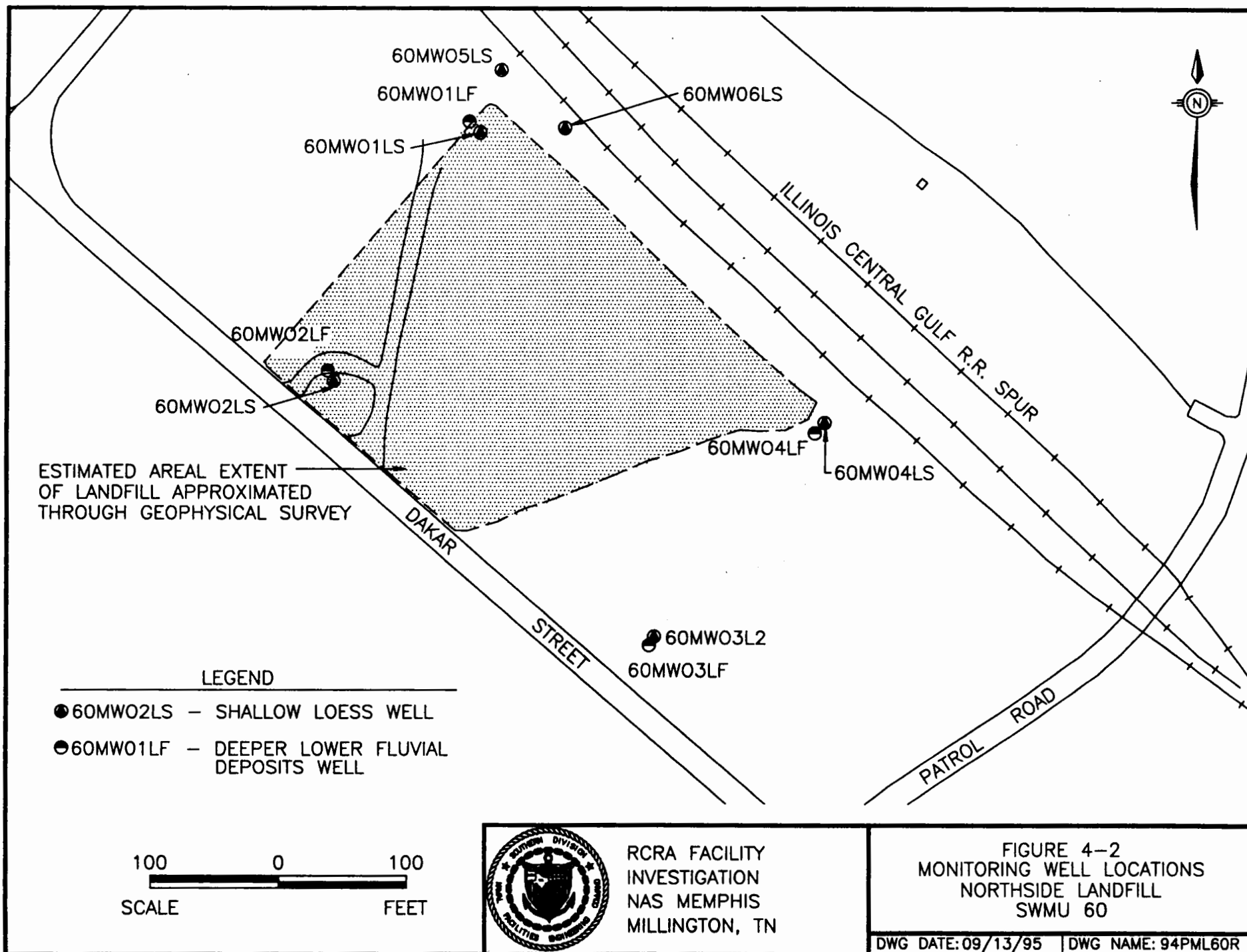












EnSafe/Allen & Hoshall

Monitoring Well 60MW01LS

Project: *NAS Memphis*

Location: *Millington, TN. SHMU 60 - North Landfill*

Project No.: *N0094*

Surface Elevation: *269.25 feet msl*

Started at *on 1-31-95*

TOC Elevation: *271.87 feet msl*

Completed at *on 1-31-95*

Depth to Groundwater: *3.30 feet*

Measured: *3/31/95*

Drilling Method: *Rotasonic*

Groundwater Elevation: *268.57 feet msl*

Drilling Company: *North Star Drilling*

Total Depth: *20.0 feet*

Geologist: *Ryan Lister*

Well Screen: *10 to 20 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
5			1	80	46.8			Silt, pale olive with heavy black staining at 0'-1' and 5'-7'.		
10			2	60	313		ML	Silt, dark yellowish orange to moderate yellowish brown, has light olive gray silt inclusions and iron streaking.		
15			3	100	3.4			Silt, olive gray to medium dark gray with moderate yellowish brown silt inclusions from 15'-20'. Black staining present at 15'-17'. No staining present from 20'-25'.		
20			4	85	30.8			Geologic description and collected analytical samples are taken from paired well MW-01-LF.	249.2	
25										
30										
35										
40										

EnSafe/Allen & Hoshall

Monitoring Well 60MW01LF Boring 60S0001

Project: *NAS Memphis*

Location: *Millington TN. ShMU#60 North Landfill*

Project No.: *N0094*

Surface Elevation: *269.19 feet msl*

Started at *0700 on 1-31-95*

TOC Elevation: *271.44 feet msl*

Completed at *0845 on 2-02-95*

Depth to Groundwater: *20.49 feet* Measured: *03/31/95*

Drilling Method: *Rotasonic*

Groundwater Elevation: *250.95 feet msl*

Drilling Company: *North Star Drilling*

Total Depth: *75.0 feet*

Geologist: *David Ladd*

Well Screen: *65 to 75 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
5			1	80	468			Silt, pale olive with heavy black staining at 0'-1' and 5'-7'.		
10			2	60	313			Silt, dark yellowish orange to moderate yellowish brown, has light olive gray silt inclusions and iron streaking.		
15			3	100	3.4			Silt, olive gray to medium dark gray with moderate yellowish brown silt inclusions from 15'-20'. Black staining present at 15'-17'. No staining present from 20'-25'.		
20					30.8		ML			
25								Silt, light olive gray to greenish gray, iron staining present (25'-30.5').		
30										
35			4	85	BG			Silt, moderate yellowish brown and dry (30.5'-40'). Some light gray silt from 38'-40', but mostly moderate yellowish brown.		
40			5	100	BG					

EnSafe/Allen & Hoshall

Monitoring Well 60MW01LF Boring 60S0001

Project: *NAS Memphis*

Location: *Millington TN. SHMU#60 North Landfill*

Project No.: *N0094*

Surface Elevation: *269.19 feet msl*

Started at *0700 on 1-31-95*

TOC Elevation: *271.44 feet msl*

Completed at *0845 on 2-02-95*

Depth to Groundwater: *20.49 feet* Measured: *03/31/95*

Drilling Method: *Rotasonic*

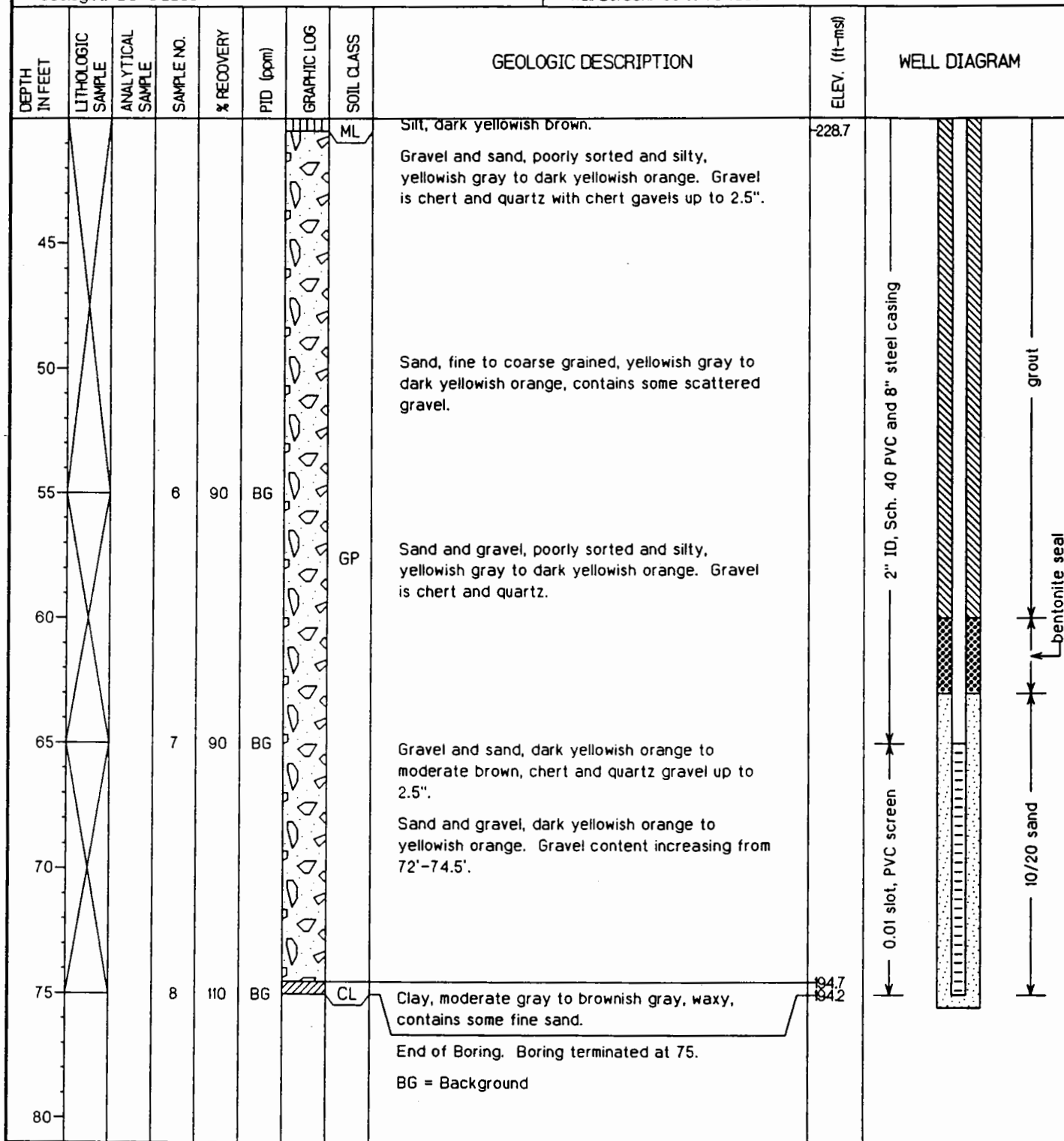
Groundwater Elevation: *250.95 feet msl*

Drilling Company: *North Star Drilling*

Total Depth: *75.0 feet*

Geologist: *David Ladd*

Well Screen: *65 to 75 feet*



EnSafe/Allen & Hoshall

Monitoring Well 60MW02LS

Project: NAS Memphis

Location: *Millington, TN. SWMU#60 - North Landfill*

Project No.: N0094

Surface Elevation: 268.85 feet msl

Started at 0830 on 2-01-95

TOC Elevation: 270.84 feet msl

Completed at 1015 on 2-01-95

Depth to Groundwater: 3.860 feet Measured: 3/31/95

Drilling Method: Rotasonic

Groundwater Elevation: 266.98 feet msl

Drilling Company: North Star Drilling

Total Depth: 20.0 feet

Geologist: Ryan Lister

Well Screen: 10 to 20 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (bpm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
5			1	70	BG			Silt, moserate yellowish brown with organics. Roots occuring at .5' and 4'. 1" gravel section at 1' stained black.		
10			2	90	BG		ML	Silt, moderate yellowish brown , with a greenish gray to light olive gray silt swirled throughout. Staining also at 9.5'.		
15			3	100	BG			Silt, olive gray with iron nodules to one quarter of an inch.		
20			4	85	BG			End of boring. Total depth of boring at 20'. Analytical and geologic description taken from paired well MW-02-LF. BG = Background	248.9	
25										
30										
35										
40										

EnSafe/Allen & Hoshall

Monitoring Well 60MW02LF Boring 60S0002

Project: *NAS Memphis*

Location: *Millington TN. SWMU#60 - North Landfill*

Project No.: *N0094*

Surface Elevation: *268.43 feet msl*

Started at *1120 on 2-01-95*

TOC Elevation: *270.90 feet msl*

Completed at *on 2-02-95*

Depth to Groundwater: *20.00 feet*

Measured: *3/31/95*

Drilling Method: *Rotasonic*

Groundwater Elevation: *250.90 feet msl*

Drilling Company: *North Star Drilling*

Total Depth: *95.0 feet*

Geologist: *Jack C.*

Well Screen: *83 to 93 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
5			1	70	BG			Silt, moderate yellowish brown with organics. Roots occurring at .5' and 4'. 1" gravel section at 1' stained black.		
10			2	90	BG			Silt, moderate yellowish brown, with a greenish gray to light olive gray silt swirled throughout. Fe staining at 9.5'.		
15			3	100	BG			Silt, olive gray with iron nodules to one quarter of an inch.		
20							ML			
25			4	65	BG			Silt, olive gray to medium light gray, iron nodules present 25'-30'.		
30								Silt, dark yellowish orange with a light olive gray to light gray silt swirled throughout.		
35										
40							GP	Silt, light gray, but making a transition to olive gray at 39.5'-40'.	228.4	

EnSafe/Allen & Hoshall

Monitoring Well 60MW02LF Boring 60S0002

Project: *NAS Memphis*

Location: *Millington TN. SWMU#60 - North Landfill*

Project No.: *N0094*

Surface Elevation: *268.43 feet msl*

Started at *1120 on 2-01-95*

TOC Elevation: *270.90 feet msl*

Completed at *on 2-02-95*

Depth to Groundwater: *20.00 feet*

Measured: *3/31/95*

Drilling Method: *Rotasonic*

Groundwater Elevation: *250.90 feet msl*

Drilling Company: *North Star Drilling*

Total Depth: *95.0 feet*

Geologist: *Jack C.*

Well Screen: *83 to 93 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PTD (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
								Lost core from 40'-43'.	228.4	
45			5	93	BG			Gravel, sandy but relatively clean, yellowish brown. Chert and quartz gravels up to 2.5" in diameter.		
50								Sand and gravel, yellowish gray to yellowish brown, stained yellowish orange near 49'. Sand is fine to very coarse grained, silty.		
55			6	100	BG			Sand with some gravel, yellowish gray, fine to very coarse grained, relatively clean.		
60							GP	Sand and gravel, yellowish gray to yellowish brown, locally stained yellowish orange. Gravel is chert and quartz, sand is fine to very coarse grained.		
65			7	90	BG			Sand with some gravel, dark yellowish orange, fine to coarse grained.		
70										
75			8	90	BG			Gravel and sand, dark yellowish orange to yellowish brown, gravel up to 2.5" in diameter.		
80								Sand with some gravel, dark yellowish orange, fine to coarse grained.		

EnSafe/Allen & Hoshall

Monitoring Well 60MW02LF Boring 60S0002

Project: NAS Memphis

Location: Millington TN. SWMU#60 - North Landfill

Project No.: N0094

Surface Elevation: 268.43 feet msl

Started at 1120 on 2-01-95

TOC Elevation: 270.90 feet msl

Completed at on 2-02-95

Depth to Groundwater: 20.00 feet Measured: 3/31/95

Drilling Method: Rotasonic

Groundwater Elevation: 250.90 feet msl

Drilling Company: North Star Drilling

Total Depth: 95.0 feet

Geologist: Jack C.

Well Screen: 83 to 93 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
85			9	90	BG		GP	Sand coarse with gravel, grayish brown to dark yellowish orange.		<p>0.01 slot, PVC screen</p> <p>10/20 sand</p> <p>bentonite seal</p>
90										
95			10	100	BG		ML	Silt, clayey, grayish brown, laminated, stiff, finely micaceous, dry.	175.4	
								End of boring. Boring terminated at 95', but bottom of well will be set at 93'.	173.4	
								BG = Background		
100										
105										
110										
115										
120										

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Monitoring Well 60MW03LS

Project: *NAS Memphis*

Location: *Millington, TN. SWMU#60 - North Landfill*

Project No.: *N0094*

Surface Elevation: *269.60 feet msl*

Started at *on 2-01-95*

TOC Elevation: *271.40 feet msl*

Completed at *on 2-01-95*

Depth to Groundwater: *7.03 feet* Measured: *3/31/95*

Drilling Method: *Rotasonic*

Groundwater Elevation: *264.37 feet msl*

Drilling Company: *North Star Drilling*

Total Depth: *20.0 feet*

Geologist: *Ryan Lister*

Well Screen: *10 to 20 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
5			1	100	BG			Silt, moderate yellowish brown with organics, very dry.		
10			2	80	BG		ML			
15			3	100	BG			Silt, greenish gray to light gray.		
20			4	80	BG					
25										
30										
35										
40								End of Boring. Boring terminated at 40'. Geologic description and analytical samples taken from MW-03-LF.	249.6	

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Monitoring Well 60MW03LF Boring 60S0003

Project: NAS Memphis

Location: Millington TN. SHMU#60 - North Landfill

Project No.: N0094

Surface Elevation: 268.90 feet msl

Started at 1330 on 2-01-95

TOC Elevation: 271.52 feet msl

Completed at 1630 on 2-07-95

Depth to Groundwater: 20.02 feet Measured: 3/31/95

Drilling Method: Rotasonic

Groundwater Elevation: 251.50 feet msl

Drilling Company: North Star Drilling

Total Depth: 95.0 feet

Geologist: Jack Carmichael

Well Screen: 77 to 87 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
5			1	100	BG			Silt, moderate yellowish brown with organics, very dry.		
10			2	80	BG					
15			3	100	BG			Silt, greenish gray to light gray.		
20			4		BG		ML			
25			5	80	BG			Silt, clayey, greenish gray.		
30			6		BG			Silt, clayey, greenish gray, iron staining and light gray silt swirling.		
35			7		BG			Silt, dark yellowish orange with a light olive gray to light gray silt swirled throughout.		
40			8	93	BG		GM	Silt, light olive gray.	228.9	

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Monitoring Well 60MW03LF Boring 60S0003

Project: *NAS Memphis*

Location: *Millington TN. SHMU#60 - North Landfill*

Project No.: *N0094*

Surface Elevation: *268.90 feet msl*

Started at *1330 on 2-01-95*

TOC Elevation: *271.52 feet msl*

Completed at *1630 on 2-07-95*

Depth to Groundwater: *20.02 feet* Measured: *3/31/95*

Drilling Method: *Rotasonic*

Groundwater Elevation: *251.50 feet msl*

Drilling Company: *North Star Drilling*

Total Depth: *95.0 feet*

Geologist: *Jack Carmichael*

Well Screen: *77 to 87 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
45			9	70	BG			Alternating sand with gravel, silty, trace clay, some intervals of real clean gravel up to one half of an inch, dark yellowish orange to grayish orange, wet.	228.9	
50			10		BG			Silt, clayey, pale yellowish brown, moist, from 49'-55' there are alternating layers of sandy gravel which are pinkish gray to dark yellowish orange. There is a super saturated interval from 49'-50.5'.		
55			11	100	BG			Sand, fine to coarse with gravel, very pale to dark yellowish orange, wet.		
60			12		BG		GM			
65			13	100	BG			Sand, fine to coarse, trace silt, gravelly, gravel increasing in size and number between 70'-75'. Color is dark yellowish orange, wet.		
70			14		BG					
75			15	95	BG					
80			16		BG		SP	Same as above except a much cleaner sand, less gravel.	93.9	

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Monitoring Well 60MW03LF Boring 60S0003

Project: NAS Memphis

Location: Millington TN. SWMU#60 - North Landfill

Project No.: N0094

Surface Elevation: 268.90 feet msl

Started at 1330 on 2-01-95

TOC Elevation: 271.52 feet msl

Completed at 1630 on 2-07-95

Depth to Groundwater: 20.02 feet Measured: 3/31/95

Drilling Method: Rotasonic

Groundwater Elevation: 251.50 feet msl

Drilling Company: North Star Drilling

Total Depth: 95.0 feet

Geologist: Jack Carmichael

Well Screen: 77 to 87 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
85			17	95	BG		SP			
90			18		BG		CL	Silt, clayey, grayish brown, stiff, mottled with laminations towards the end of the run.	181.4	
95			11	110	BG			End of Boring. Boring terminated at 95'.	173.9	
100										
105										
110										
115										
120										

0.01 slot, PVC screen



10/20 sand
backfill

EnSafe/Allen & Hoshall

Monitoring Well 60MW04LF Boring 60S0004

Project: <i>NAS Memphis</i>	Location: <i>Memphis, TN</i>
Project No.: <i>N0094</i>	Surface Elevation: <i>269.67 feet msl</i>
Started at <i>0915 on 1-31-95</i>	TOC Elevation: <i>272.20 feet msl</i>
Completed at <i>1215 on 2-08-95</i>	Depth to Groundwater: <i>20.70 feet</i> Measured: <i>3/31/95</i>
Drilling Method: <i>Rotasonic</i>	Groundwater Elevation: <i>251.61 feet msl</i>
Drilling Company: <i>North Star Drilling</i>	Total Depth: <i>96.0 feet</i>
Geologist: <i>Jack Carmichael</i>	Well Screen: <i>86 to 96 feet</i>

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (bpm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
5			1	80	BG			Silt, moderate yellowish brown with organics, very dry.		
10			2	80	BG			Silt, moderate yellowish brown with fewer organics. Wet from 5'-9', but becomes wet at 9'-10', moist.		
15			3	100	80.1			Silt, medium light gray, moist down to 20.5 then becoming dry. Some iron staining at 27'.		
20			4		3.4		ML			
25			4	90	BG					
30			5		2.9					
35			6		60.2			Silt, moderate yellowish brown dry to slightly moist.		
40			7	87	BG					

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Monitoring Well 60MW04LF Boring 60S0004

Project: *NAS Memphis*

Location: *Memphis, TN*

Project No.: *N0094*

Surface Elevation: *269.67 feet msl*

Started at *0915 on 1-31-95*

TOC Elevation: *272.20 feet msl*

Completed at *1215 on 2-08-95*

Depth to Groundwater: *20.70 feet*

Measured: *3/31/95*

Drilling Method: *Rotasonic*

Groundwater Elevation: *251.61 feet msl*

Drilling Company: *North Star Drilling*

Total Depth: *96.0 feet*

Geologist: *Jack Carmichael*

Well Screen: *86 to 96 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
45			8		BG		ML	Sand, gravelly, silty with clayey gravel seam at 51.5'-52'. Grayish brown to dark yellowish orange, wet.	224.7	
50			9		BG					
55			10	90	BG			Sand, gravelly, and silty. Color change from 55'-58' turning pinkish green, then becoming dark yellowish orange at 58'-65', wet.		
60			11		BG					
65			12	95	BG		GM			
70			13		BG			Gravel starting to increase and color starting to change to yellowish orange.		
75			8	90	BG					
80			9	100	BG			Gravel increasing still and color changing to grayish orange.		

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Monitoring Well 60MW04LF Boring 60S0004

Project: *NAS Memphis*

Location: *Memphis, TN*

Project No.: *N0094*

Surface Elevation: *269.67 feet msl*

Started at *0915 on 1-31-95*

TOC Elevation: *272.20 feet msl*

Completed at *1215 on 2-08-95*

Depth to Groundwater: *20.70 feet*

Measured: *3/31/95*

Drilling Method: *Rotasonic*

Groundwater Elevation: *251.61 feet msl*

Drilling Company: *North Star Drilling*

Total Depth: *96.0 feet*

Geologist: *Jack Carmichael*

Well Screen: *86 to 96 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
85			10	87.5	BG		GM	Sand, gravelly with silt, gravel up to 2" in diameter towards the bottom. Color is dark yellowish orange and section is wet.		
90								Gravel, sandy, silty with small amounts of clay. Cobbles up to 3" in diameter, very dark yellowish orange, wet.		
95			11	112.5	BG			Silty, upper 2" is reddish brown stained, lower 3"-4" laminated pale brown, moist.	73.7	
100								End of boring at 96'.		
								BG = Background (1.1 ppm)		
105										
110										
115										
120										

EnSafe/Allen & Hoshall

Monitoring Well 60MW05LS Boring 60S0005

Project: *NAS Memphis*

Location: *Millington, TN. SHMU#60 - North Landfill*

Project No.: *N0094*

Surface Elevation: *269.75 feet msl*

Started at *0830 on 2-13-95*

TOC Elevation: *271.88 feet msl*

Completed at *0900 on 2-13-95*

Depth to Groundwater: *4.09 feet* Measured: *3/31/95*

Drilling Method: *Rotasonic*

Groundwater Elevation: *267.89 feet msl*

Drilling Company: *North Star Drilling*

Total Depth: *20.0 feet*

Geologist: *Jack C.*

Well Screen: *10 to 20 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
5			1	100	1.4			Fill, dark brown silt with scattered gravel. Silt, clayey, soft light olive gray to grayish orange, mottled, dark brown inclusions, moist, finely laminated. Silt, clay, greenish gray, mottled dark yellowish orange, laminated, soft, moist. Silt, clay, grayish orange mottled yellowish orange, laminated with dark inclusions, soft, moist.		
10			2	80	BG		ML			
15			3	90	BG			Silt, clayey, pale yellowish brown, becoming stained yellowish orange from 18'-19'.		
20			4	80	BG			Silt, clayey, medium gray, massive, moist.	249.7	
25								BG = Background (1.1 ppm)		
30										
35										
40										

EnSafe/Allen & Hoshall

Monitoring Well 60MW06LS Boring 60S0006

Project: *NAS Memphis*

Location: *Millington, TN SWMU#60 - North Landfill*

Project No.: *N0094*

Surface Elevation: *269.58 feet msl*

Started at *1020 on 2-13-95*

TOC Elevation: *271.98 feet msl*

Completed at *1050 on 2-13-95*

Depth to Groundwater: *3.37 feet* Measured: *3/31/95*

Drilling Method: *Rotasonic*

Groundwater Elevation: *268.58 feet msl*

Drilling Company: *North Star Drilling*

Total Depth: *20.0 feet*

Geologist: *Jack Carmichael*

Well Screen: *10 to 20 feet*

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (ppm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
5			1	40	BG			Fill, dark brown silt with scattered gravel. No sample description; poor recovery.		
10			2	133	BG		ML	Silt, clay, moderate yellowish brown to grayish orange, mottled brown, soft, moist.		
15			3	130	BG			Silt, clay, moderate yellowish brown, laminated with dark inclusions, becoming stained dark yellowish orange from 12.5'-13'.		
20			4	100	BG			Silt, clayey, moderate yellowish brown mottled with dark inclusions, finely laminated, soft. Silt, clayey, medium gray, moist, soft.	249.6	
25								BG = Background (1.1 ppm)		
30										
35										
40										

EnSafe/Allen & Hoshall

Monitoring Well 60MW04LS

Project: NAS Memphis

Location: Millington, TN SWMU#60 - North Landfill

Project No: N0094

Surface Elevation: 269.57 feet msl

Started at 0915 on 1-31-95

TOC Elevation: 272.11 feet msl

Completed at 1215 on 1-31-95

Depth to Groundwater: 4.95 feet Measured: 3/31/95

Drilling Method: Rotasonic

Groundwater Elevation: 267.16 feet msl

Drilling Company: North Star Drilling

Total Depth: 20.0 feet

Geologist: Ryan Lister

Well Screen: 10 to 20 feet

DEPTH IN FEET	LITHOLOGIC SAMPLE	ANALYTICAL SAMPLE	SAMPLE NO.	% RECOVERY	PID (bpm)	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	ELEV. (ft-msl)	WELL DIAGRAM
5			1	80	BG			Silt, moderate yellowish brown with organics, very dry.		
10			2	80	BG		ML	Silt, moderate yellowish brown with fewer organics. Wet from 5'-9', but becomes wet at 9'-10'.		
15			3	100	80.1			Silt, medium light gray, moist down to 20.5 then becoming dry. Some iron staining at 27'.		
20			4		3.4			End of boring at 40'. Geologic description and analytical samples are taken from paired well MW-04-LF.	249.6	
25										
30										
35										
40										

Attachment 3

Dieldrin Technical Memorandum

DISCUSSION OF DIELDRIN RISK MANAGEMENT ISSUES

Chlorinated pesticides (specifically dieldrin) were used extensively in the 1950s and 1960s during a white fringed beetle quarantine. NAS Memphis has record that the agents were applied aerially for their intended purpose over the majority of the base. During the RCRA Facility Investigation, dieldrin and other chlorinated pesticides were detected in most surface soil and some vadose soil samples collected at specific SWMUs and background locations. Due to the ubiquitous presence of dieldrin in site soils, the following assessment was performed to support risk management decisions to be made by the BCT.

Figure 1 shows reported surface (0-1 ft.) soil dieldrin concentrations across the northern portion of the base. As shown in the figure, levels at SWMUs ranged from below quantitation limits to 609 $\mu\text{g/kg}$ (average of duplicate results at SWMU 5, boring 4). At background locations, concentrations ranged from below quantitation limits to 311 $\mu\text{g/kg}$ with a mean of 131 $\mu\text{g/kg}$.

In order to provide an evaluation of the significance of the reported levels, standard risk assessment methods were employed. Default assumptions for residential and occupational exposure scenarios were used to project dieldrin-related carcinogenic risk through incidental ingestion and dermal contact soil pathways. For each exposure scenario, risk was computed using the maximum and mean SWMU-specific dieldrin concentrations. The results of this process are provided in the attached table.

As shown in the table, SWMU 5 had the highest projected soil pathway risk associated with dieldrin at maximum concentrations (2.2E-5). The SWMU 5 risk estimate was approximately twice that of the corresponding background. When mean concentrations were used as the exposure point concentration, SWMU 8 dieldrin risk was found to be the highest although it did not differ appreciably from background. In no instance (onsite or background) did dieldrin risk projections exceed 1E-4. This finding indicates that dieldrin levels found at each SWMU do not necessitate remedial action in the absence of other significant carcinogenic risk contributors. USEPA's generally acceptable range for carcinogenic risk is 1E-4 to 1E-6.

Soil dieldrin is not expected to pose a substantial threat to shallow groundwater at any SWMU or background location. This conclusion is based on the strong soil binding properties of the compound as well as empirical data for vadose soils which show no significant vertical migration has occurred.

A historical use discussion is also helpful to provide a frame of reference for evaluating reported soil dieldrin (and other chlorinated pesticide) concentrations. Information provided by NAS Memphis states that chlorinated pesticides (primarily chlordane) were previously used until the late 1980's for termite control around buildings. Although chlordane was used as a single active ingredient application, mixtures including dieldrin, aldrin and heptachlor

were also common in the pest control trade. Standard application rates resulted in soil concentrations of 500 to 1,000 mg/kg total chlorinated pesticides (or 500,000 $\mu\text{g/kg}$ to 1,000,000 $\mu\text{g/kg}$). For comparison, a 10:1 chlordane:dieldrin mixture used for general subterranean termite control would have resulted in residual soil dieldrin concentration of 50 to 100 mg/kg. These residual application levels are 50 to 100 times higher than the maximum soil dieldrin concentration reported in the RFI.

It should be mentioned that Aroclor-1260 (a polychlorinated biphenyl or PCB) was detected in four soil samples collected at SWMU 5 and one sample from SWMU 7. In each instance, dieldrin was also detected although no strong concentration correlation was observed. Concentrations at SWMU 5 ranged from non-detect to 223 $\mu\text{g/kg}$. The single hit reported at SWMU 7 was 20,000 $\mu\text{g/kg}$ in the boring 7 surface soil sample. Boring 7 at SWMU 7 is actually closer to Building N-16. As a result, the RFI workplan for N-16 should include provisions for further delineating the soil PCB contamination.

This memo was intended to provide a risk-based framework for decision making regarding how the dieldrin issue is resolved. Although standard risk assessment techniques were applied, final resolution of this issue will require a consensus risk management decision. Of paramount importance is the determination of what level of risk is acceptable in light of the extent of the dieldrin. EnSafe/Allen & Hoshall as the contractor can only provide the facts and suggestions for a viable risk management strategy. The following paragraph outlines suggestions based on currently available information and the preceding risk evaluation.

Due to the ubiquitous presence and documented proper historical use, institutional controls are considered the most appropriate means of dealing with the dieldrin issue from a human health perspective. These controls may include (but are not limited to) public/worker awareness, access restrictions and maintenance of adequate vegetative cover to minimize contact. The focus of future investigative efforts should center around prevention of further migration (i.e. surface runoff) and evaluation of sensitive ecological receptor points (i.e. terrestrial habitats, drainage systems, streams, lakes and pond). These areas should be emphasized as little control can be exercised over the animals who use them.

NAS-Memphis Dieldrin Risk Projections

Location	Maximum Dieldrin (mg/kg)	Mean Dieldrin (mg/kg)	Residential		Industrial	
			@ Max	@Mean	@ Max	@Mean
SWMU 1	0.192	NA	7.04E-06	NA	1.12E-06	NA
SWMU 3	0.023	0.0072	8.43E-07	2.64E-07	1.34E-07	4.19E-08
SWMU 5	0.609	0.126	2.23E-05	4.62E-06	3.54E-06	7.33E-07
SWMU 7	0.055	0.0095	2.02E-06	3.48E-07	3.2E-07	5.52E-08
SWMU 8	0.471	0.144	1.73E-05	5.28E-06	2.74E-06	8.37E-07
SWMU 60	0.069	0.0155	2.53E-06	5.68E-07	4.01E-07	9.01E-08
Background	0.311	0.131	1.14E-05	4.8E-06	1.81E-06	7.62E-07

Oral Slope

Factor

(mg/kg-d)-1

16